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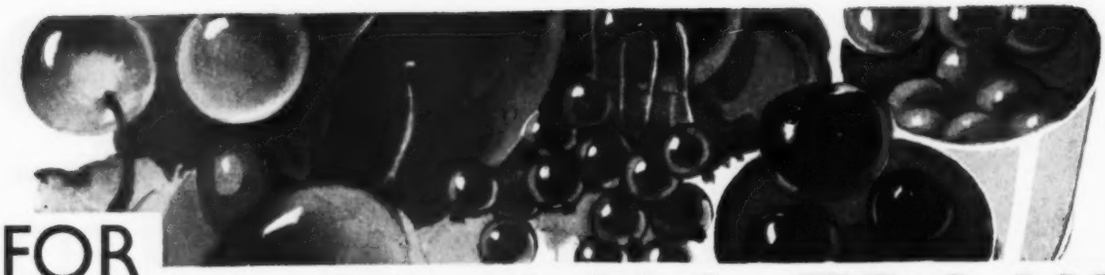

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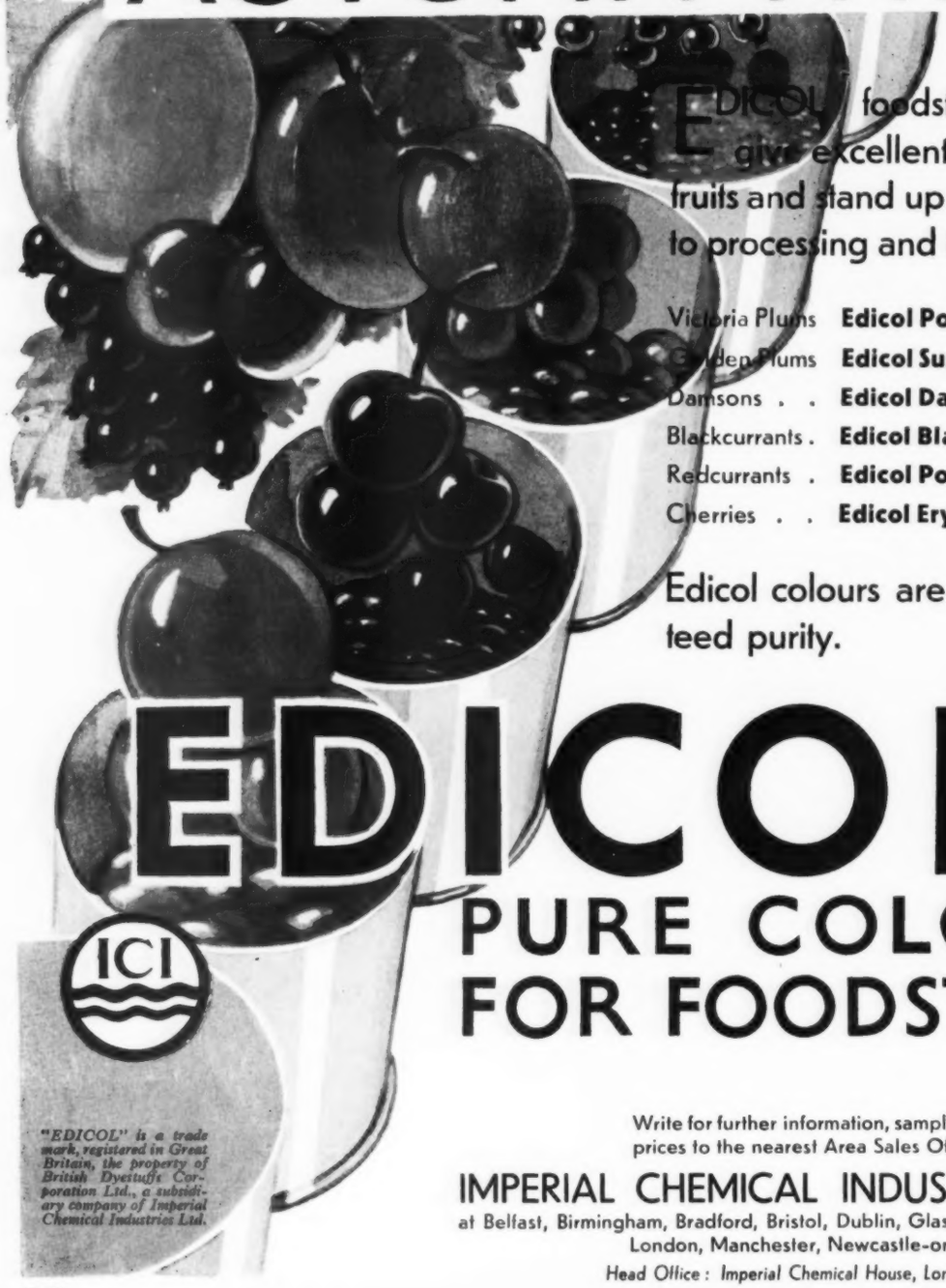

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# FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

**Volume . . . IX**
**Number . . . 7**

JULY . . 1934

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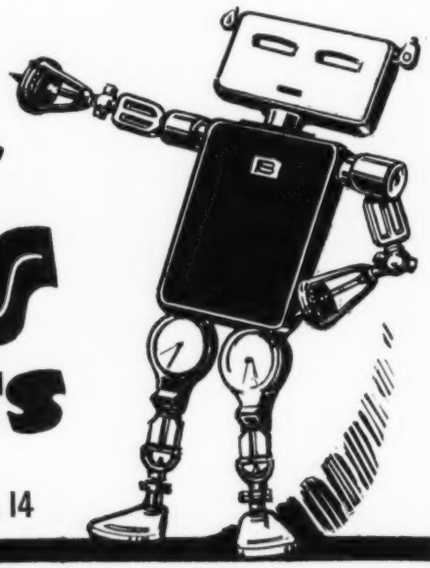

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# FOOD MANUFACTURE

Vol. IX, No. 7 July, 1934

## Wheat Quota Burden

**WE NOTICE** that the master bakers are beginning to feel the burden of the wheat quota. At the recent meeting of the Scottish Association of Master Bakers in Dundee, Mr. Muirhead, convener of the Advisory and Parliamentary Committee, described the wheat quota as "a burden which lies heavy on the Trade and gives it serious concern." He pointed out that it had stood for some considerable time at the maximum of 4s. 6d. per sack and showed no signs of abatement. In the protest made by the Committee to the Minister of Agriculture and Secretary of State for Scotland, it was pointed out that Continental wheat was being imported and sold at prices under home wheat, and it was suggested that this might be excluded and the duty increased in order to enhance, if possible, the price of home grown, and thereby lessen the quota charge—an oncost which it was impossible wholly to pass on to the consumer. The Secretary of State said in reply that statistics did not bear out their contention that imported Continental wheat affected the home market, and that in any case, under treaty obligations, restriction could not be enforced until legislative control over home production had been brought into operation. The worthy gentleman did not, however, attempt to explain why the quota is 4s. 6d. a sack instead of the original calculation of 2s. 3d. When calculations are upset to the extent of 100 per cent. something is radically wrong. Doubtless statistics could be produced to explain this, but in the meantime the bakers and consumers between them are having to bear a big burden.

## The Nation's Food

Some very important facts on the bearing of our agricultural policy on the national health were discussed by Dr. John Orr, Director of the Rowett Institute at Aberdeen, in his recent Chadwick Lecture. Dr. Orr has made a close study of problems of nutrition affecting both farm animals and human beings, and his views should be carefully considered when the course of agricultural policy is being shaped. At present agriculture is being subjected to many experiments and tariffs; quotas and subsidies are being tried in order to raise farm produce prices, to keep the home farmer in business. So far these do not seem to have done much good, and farmers should be careful not to bank on methods that may break down in operation or on policies dependent on the Government of the day. These may ultimately ruin farmers and do harm to the nation as a whole. The main principle of national agricultural planning appears to be co-operation rather than competition. In the bacon scheme we can see the nucleus of a co-operative plan by which it is hoped to maintain a steady market. As Dr. Orr pointed out, however, we cannot afford to leave our food supply entirely to the economists. The welfare of the community has to be considered, and the public health aspect is as important as the economic point of view. The system of marketing boards must be closely watched. It is in the interest of the home producer that the disastrously low prices of recent years should be adjusted to a more reasonable level, but it is also in his interest that his products should be purchased freely and increasingly. High prices produced by scarcity can be no use to him in the long run. It is vitally important that the marketing schemes should not only assist the producer, but protect the consumer against excessive prices of either home produced or imported foodstuffs.

## Dr. Orr

As a matter of fact this lecture of Dr. Orr was one of the most able expositions of a complex problem which we have ever heard. First the

problem in its economic and dietetic aspects was clearly stated, and then was followed by an exhibition of the application of scientific and commonsensed analysis, which would have been equally well received either by a gathering of scientists at Burlington House or by a meeting of business men in London Wall. The pity is that it was not given the publicity which it deserved and that it was wasted on the " desert air " of Whitehall.

## Campden

The annual meeting of subscribers was held at the Campden Research Station for Fruit and Vegetable Preservation on May 2, 1933, when the second Annual Report (1932-33) was presented. A careful study of this Report is well worth while, for, besides giving valuable information on certain specific matters connected with canning, it outlines the present state of our technical knowledge and indicates the problems which urgently await solution.

We are extremely glad to hear that the calls made by the industry upon the Station's resources have necessitated an increase in the scientific staff and an extension of the laboratories, and that the canners have contributed liberally towards the cost. We have the greatest admiration for, and implicit faith in, the Director, Mr. F. Hirst, M.Sc., A.R.C.Sc., and his right-hand man, Mr. W. B. Adam, M.A., A.I.C. For years both have worked like Trojans, and the British canning industry is indebted to them more than can ever be put into words—even on a cheque. No one knows this better than the canners themselves, and whatever form the expression of gratitude eventually takes, it cannot err on the side of excessive generosity.

## Moulds

It is stated in the Report that, on the research side, the most urgent scientific problem is the discovery of the source of infection and the method of eradication of the heat-resistant mould *Byssochlamys fulva*, which is causing serious losses in canned and bottled fruit in this country.

It will be recollected that we have previously drawn attention to this mould in connection with the work of Rendle, Oliver, and Raistrick.

## Bacteria

The main bacteriological investigations on hand at Campden are the control of thermophilic bacteria responsible for spoilage in canned vegetables. Of course sugar is suspect—as it was in America, where it was subsequently proved to be a carrier of spores of heat-resistant bacteria. It is advised that serious factory infection should be studied on the spot by members of the staff using portable apparatus.

## New Products

For many of the new products being canned in this country, satisfactory sterilisation times and temperatures have been worked out at Campden. As we frequently point out to enquirers applying to us for information, the Report remarks that before this can be done heat penetration tests have to be carried out, and to make practical use of the results obtained it is necessary to study the heat-resistance of spoilage bacteria. In this connection it is good news to hear that a new thermal deathpoint apparatus is being built at the Research Station.

## Other Researches

Other researches pending and in progress which are reviewed in the Report include the development of new varieties and strains of canning fruits and vegetables more suited than those at present used; the corrosion, straining, buckling, and lacquering of cans; the retention of vitamins in canned foods; the physiological effects of traces of metals in canned foods, and other researches of a nutritional character.

## The Report

As for the Report itself, this includes a number of papers recording the results of investigations into varieties of fruits and vegetables for canning, the grading and packing of vegetables, the internal rusting of cans, the heat-resistant mould *B. fulva*, vacuum and its measurement, and bitterness in canned cream.

## Tinplate

While on this subject of research, we take the opportunity of drawing attention to two bulletins recently issued by the International Tin Research and Development Council. One deals with the tin-iron alloy in tinplate with notes on some imperfections, written by W. E. Hoare, B.Sc., and the other is an account of a microscopical examination of iron-tin reaction products by Mr. Hoare and

W. D. Jones, B.Eng., Ph.D. These bulletins constitute a valuable contribution to our knowledge of this subject and should be carefully studied by both canners and tinplate manufacturers.

This work forms part of a programme being carried out by the I.T.R.D.C., and if it is a fair sample of what one may expect to follow, we have no hesitation in stating that the Council will play an exceedingly valuable part in the canning and tinplate making industries of this country.

## Lactalbumin

At the Bureau of Dairy Industry, P. D. Watson has succeeded in designing a piece of apparatus for the production of electrodialysis of lactalbumin (whey protein), which is so low in ash content as to be a suitable ingredient of infant foods, thus correcting the deficiency of lactalbumin in cow's milk as compared with human milk. This addition would aid in the formation of a finely divided, easily digestible curd in the infant's stomach. Actual tests have shown that cow's milk modified with 5 per cent. of the lactalbumin powder will yield a finely divided curd upon acidification with dilute hydrochloric acid to the *p*H range of infant digestion.

## A Modified Milk

Moreover, it is stated that lactalbumin is an essential protein for growth and for the correction of deficiencies in other proteins. It is possible by the proper dilution of cow's milk with water and the addition of fat, lactose, and the dialysed powder, to adjust the amount of albumin and other substances to approximately that of breast milk without appreciably increasing the total protein content, or raising the buffer value excessively. The presence of lactose in the powder makes it possible to reduce the amount of this sugar which it would be otherwise necessary to add. In making up such a modified milk, the amount of the dialysed whey protein necessary in the mixture would be less than 30 per cent. on the dry basis.

## Lead in Food

The question of the determination of lead in foodstuffs has been receiving much attention recently, and in our February issue we referred to the work of Lampitt and Rooke on the occurrence and determination of lead in sardines. Apparently the estimation of lead in certain substances is not easy, and we understand that very widely discrepant results were obtained on the same sample of baking powder by a number of well-known analysts in this country. For a thorough review of the whole subject of determination of lead in foods we would refer those interested to a most important paper by Wichmann and five others that appeared in the *Journal of the Association of Official Agricultural Chemists*, vol. 17, 1934, p. 108. The principal objective of this particular work was the determination of lead on sprayed fruits and vegetables, but the principles of the methods described are generally applicable to the determination of lead in other materials, with the possible exception of those in which interfering substances not encountered in spray residues are present. Six methods are described in the paper in the order in which they were developed, and it is concluded that the last one—the colorimetric diphenylthiocarbazone (called dithizone for short) method of Vorhes-Clifford—is the best. This work is a most valuable contribution to the literature dealing with the estimation of small amounts of poisonous metals in foods.

## Cocoa Butter

S. A. Ashmore read a paper recently before the Society of Public Analysts describing a new apparatus for determining the temperature of crystallisation of cocoa butter. The temperature at which separation of solid fat occurs is a constant for each fat, and an apparatus has been devised whereby this temperature can be determined with rapidity and precision on as little as 2 gm. of fat. The Tyndall effect has been utilised by projecting a beam of light through a small tube containing the melted fat suitably enclosed in a darkened chamber; as soon as any separation of solid particles occurs, a scattering of light takes place, and the tube appears luminous against the darkened background. The temperature at which this is first seen is noted and termed the crystallisation temperature; for cocoa butter it has proved to be a valuable criterion of purity.

## Packaging Developments

At the first Modern Packing Exhibition, held at the Dorland Hall, Regent Street, London, S.W. 1, from May 30 to June 9, there was a great deal of interest to readers of this journal.

One of the finest collections of commercial photo-

graphs we have ever seen demonstrated very clearly how the art of the photographer can be applied to packaging and sales presentation. Examples of the work of the artist and designer were also shown.

Lectures and discussions brought forth the views of the general manager, the advertising manager, etc., and put them into relation with those of the package manufacturer; films of the commentary type showed the packaging methods adopted by several of the leading manufacturers.

Among the boxes displayed were many novel designs, and it was very clear that the men making the packs are fully conversant with the needs of the moment.

Details of some of the exhibits appear on another page.

## Insect Spoilage

In this issue will be found an article by Mr. Passmore on the warehouse and factory insect nuisance, in which he reviews the problem as it is seen by an entomologist. It is strange that, in times when there is generally no hesitation in submitting industrial problems to scientific experts, the serious one of insect infestation should usually be ignored, brushed-up, or treated with an empirical remedy.

The key fact of the whole situation seems to be the world-wide movement of these insects. No outbreak is spontaneous: it is always the result of a previous infestation, possibly remote, such as in a warehouse, the hold of a ship, or a foreign packing shed. A thorough investigation is long overdue.

Without the skill of the field entomologists it is questionable whether the large scale farms and plantations of modern times could continue to exist. Those who study the stored product insects are just as eager to help. All that is needed is the co-operation and encouragement of industry.

## Damping of Sugar

According to R. Svatek, crystals of completely dried sugar became damp due to condensation of water upon their surface during temperature changes, forming a film of syrup. Because of the high specific heat of the sugar crystals, the temperature changes in the sugar during storage are slower than in the air; under such conditions the air may be in contact with colder crystals.

Damping is prevented by heating storehouses to maintain a constant temperature and avoiding temperature gradients between the sugar and the air.

## "The World's Mine Oyster"

Thus spake Shakespeare, and recent events have shown that the oyster can cause a world of trouble. After eating oysters at a St. Leonards hotel a visitor had an attack of typhoid fever which kept him away from work for five months. He sued the hotel for damages for breach of warranty and negligence. The hotel denied liability and brought in the fishmonger who had supplied the oysters, and he, in turn, brought in the company which sold him the oysters from its oyster beds. We understand that there is nowadays a new procedure for actions where third and fourth parties are involved. While the first party is attacking the second, the third and fourth are allowed to appear and cross-examine the witnesses, but cannot themselves call evidence till the first issue is decided. We believe that this is the first case of its kind to be dealt with by a jury under the new method. In the first place the hotel had to admit that if the food supplied made anyone ill they were liable. Judgment was given against the hotel for £725. The hotel proprietors next sued the fishmonger. He could not deny his legal responsibility, and submitted to judgment for £725 in favour of the hotel, and proceeded to sue the company from which he got the oysters.

## The Last Stage

New evidence was now produced, and the oyster bed company called witnesses who had had typhoid without eating oysters, and others who had eaten oysters out of the self-same barrel and had not contracted typhoid. Bacteriologists were called to give the beds the highest character. The jury then decided that the fishmonger had not proved that he had been supplied with contaminated oysters, and he had to pay the damages of £725, together with costs of the hotel proprietors and the oyster bed company. We wonder whether the jury would have found in the first instance that the patient's typhoid was due to the oysters at all if it had heard the subsequent evidence of those oysters' blameless upbringing. Possibly not, and it seems very hard luck on the fishmonger, against whom no evidence of uncleanliness or neglect had been brought. He probably thinks the law is an ass, but, as Lord Macmillan once said, "While you are all presumed at your peril to know the law, no steps whatever are taken by anybody to tell you anything about it."

# SOUP CANNING

## An Account of American Procedure

THE CANNING of soups is a well-established industry in the U.S.A., where the production of canned soups has attained tremendous proportions, amounting to millions of cases annually by one manufacturer alone. The average American housewife gives canned soup a prominent and frequent place on her menu during summer as well as winter months; from the point of view of economy, convenience, and appetite appeal the soup she can buy in a can offers many advantages over the soup she can prepare herself.

Undoubtedly the popularity of canned soup is in part explained by the extensive and persistent advertising of the manufacturers. Manufacturers of soup appreciate the value of repetition in advertising; the housewife is continually reminded of the fact that canned soup is available in all the popular varieties at a price within the reach of everyone, and of a quality probably superior to the home-made product, with no time or trouble involved in the preparation. In the daily newspapers, in the weekly and monthly magazines, from posters and signboards, the merits of canned soup are proclaimed year in and year out, with the result that soup is accepted as a necessary adjunct to any well-balanced meal—and of course the soup comes out of a can.

Needless to say, this widespread advertising would be of little permanent value if it were not backed up with a high quality product, available at a low price. Condensed soup is sold in the U.S.A. for 6d. or less per 10-oz. can, making one pint of ready-to-serve soup, and it is available in many different varieties, the Campbell Soup Company offering twenty-three varieties and the H. J. Heinz Company fifteen varieties.

### Types of Soup

It is interesting to note that most of the canned soup made in the U.S.A. is very mildly seasoned; in general herbs or spices with a strong or pronounced flavour are avoided, the soup depending mainly on the meat or vegetables it contains for its flavour. " Thick " soups of the oxtail or mock turtle type are also unpopular; the public taste prefers a thinner soup with a mild flavour. On the other hand, so-called " clear soups " are not manufactured to any extent, which may account for the fact that bottled soups are almost unknown in the U.S.A. It is an interesting question to consider whether a mild-flavoured soup of the type popular in the U.S.A. would meet with approval in England, where, as evidenced by many diversified food products (such as chocolate, cakes, jams, cheese, pickles, vinegar, and even beer), the prevailing taste appears to favour products more strongly flavoured than the corresponding products in the U.S.A. There is no doubt that it is possible to consume greater quantities of a mildly flavoured soup than of a rich, strongly flavoured product, and the methods of making soup in the U.S.A. should repay some study.

Consideration of the processes employed in the manufacture of a few of the more popular varieties will illustrate the general principles involved in the selection of raw materials and the preparation of the finished product.

*(Courtesy of the International Nickel Company.)*

**Close-up View of Steam Jacketed Kettles.**

## Tomato Soup

Tomato soup is the most popular variety in Canada and the U.S.A., where it is made almost invariably from fresh tomatoes. Although tomato soup can be made from tomato pulp or purée, it is essential to use fresh tomatoes in order to obtain a really satisfactory colour and flavour. Tomato soup is generally made in the condensed or concentrated form. Cream of tomato soup is not manufactured to any great extent, as, if a cream soup is desired, the concentrated plain tomato soup may be diluted with milk instead of water, thereby overcoming the undesirable changes in colour and consistency which occur in the canning of cream of tomato soup.

The first stages in the preparation of tomato soup follow those described previously in the manufacture of *tomato purée* (see FOOD MANUFACTURE, 1932, October, p. 301). The tomatoes are washed, sorted, and trimmed before being pulped. The pulping may take place by passing the scalded tomatoes through an ordinary cyclone, provided with a screen having fairly large perforations—*e.g.*, 0·06 inch—or the tomatoes may be chopped and this material used as a basis for the preparation of the soup. In either case the extracted juice or pulp, in the manufacture of condensed soup, is concentrated to about 60 to 75 per cent. of its original volume before blending with the other ingredients. This concentration is frequently carried out in evaporating tanks similar to those used in making tomato pulp or catsup; if chopped tomatoes are used, they are put through a finisher with perforations in the screen of about 0·04 inch before pumping to the blending kettle, which is made of tinned copper or pure nickel. *Butter* in amounts up to 1 per cent., according to flavour desired and cost permissible, is added to the concentrated pulp in the blending kettle, together with chopped, peeled, fresh *onions* in proportions up to 5 per cent. according to taste. The onions are usually extracted for thirty minutes or so in a separate kettle before adding to the blending kettle. *Sugar* and *salt* are added according to taste. It is also customary to add *bicarbonate of soda* to neutralise any excess acidity, the amount being ½ to 1 gm. of bicarbonate per pound of soup, according to taste. A small amount of *white pepper* is also added, together with a little suitable *seasoning*, such as celery, parsley, cassia, mace, allspice—these being added as a water extract made by infusion of the spices and herbs for thirty minutes or so, or else in the form of essential oils.

Finally, after all these ingredients have been added and the batch brought to the boil, the soup is thickened by the addition of a *thickening agent* such as cornstarch, wheat flour, cracker meal, or a combination of these, added in the form of a paste with water or with tomato pulp if dilution is to be avoided. *Cracker meal* is widely used as a thickener for soups in the U.S.A. This is made from "crackers", which are baked from selected flours at a temperature of 500° to 600° F., allowed to dry, and then finely ground and sieved to various grades of fineness, according to requirements. Usually no fat or shortening is used in baking these crackers, but the roasting process results in a cereal product which, in addition to producing the usual thickening effect of flour and other starches, gives "body" to the soup, and is free from the objectionable starchy flavour often associated with wheat or cornflour.

The thickened soup is then passed through a finisher with a fine screen (0·027 inch), which removes pieces of onion and spices and smooths out the thickeners. The soup is filled at once into plain tin cans, which are processed at 240° F. for fifteen minutes for a 10-oz. can, or twenty-five minutes for a 16-oz. can. The soup is filled by machine, and is usually 180° F. or hotter when sealed. A temperature of 212° F. for processing is satisfactory if no bicarbonate is used, but 240° F. is safer. The cans must be cooled immediately after cooking if a scorched flavour is to be avoided, cooling to a temperature of 100° to 110° F. before stacking.

## Vegetable Soup

Vegetable soup follows closely behind tomato soup in popular esteem in Canada and the U.S.A. As the name implies, this is essentially a soup containing a blend of vegetables, many different varieties being used in its preparation. The vegetables generally employed are potatoes, carrots, turnips, celery, onions, tomatoes, leeks, okra, peas, lima beans, pimientoes or red peppers, cabbage, corn, string beans, and sweet potatoes, with often some barley, rice, or lentils included, together with "noodles" fashioned in the form of letters or stars or other distinctive shapes. The raw materials are generally selected with considerable care, and given very careful inspection at all stages of the handling processes. Potatoes, carrots, and turnips are generally purchased fresh, peeled by machine, trimmed, and then mechanically diced to the required size. The peeled and trimmed vegetables are kept covered with water, or preferably with weak brine during the intervals between one operation and the next.

Metal containers are used for handling the vegetables; galvanised metal is satisfactory for this purpose, but if tinned iron, pure nickel, monel metal, or stainless steel equipment is available, this is to be preferred, as there is less risk of metallic contamination as the equipment gets older. Pimientoes (red pepper) and okra are purchased preserved in salt brine, and are ready for use after trimming and cutting to size. Cabbage and celery are generally available fresh, and must be thoroughly cleaned and washed before use. Corn and peas are generally available in the canned form only; dried peas may be used, but are not much favoured in the U.S.A., as the smaller size and better appearance of the canned green peas is preferred. Dried lima beans may also be used, but canned "baby" limas are better on account of the higher quality of the canned product. Tomatoes are also obtained from the canned product, and frequently tomato pulp is used in the preparation of the stock or background of the soup.

Most vegetable soups contain some or all of the vegetables listed above, in varying proportions depending on the taste required and the price of raw materials compared with cost desired in soup, etc.

There is considerable difference of opinion as to the best method of preparing the base or background of the soup.

"*Stock*" usually forms the background of the soup; this is made partly from bones and partly from lean beef. Bones when used are generally extracted under pressure, and the yield of extractive material is carefully controlled and regulated; this stock is reinforced by a stock made from lean beef, usually extracted by simmering gently with an excess of water for six to eight hours. Time of extraction and yield of stock are carefully standardised to obtain a uniform product. Where meat trimmings from other meat products are used in making stock it is important to standardise the extraction as far as possible, and to regulate the salt content in order to maintain uniformity. A good soup cannot be made without a good stock, which must be of uniform quality and composition. Iron vessels may be used for the extraction of the stock if the dark colour obtained is not objectionable, but stainless steel or nickel kettles are preferable. The stock should be handled in metal containers; stainless steel, nickel, monel metal, or well-tinned iron are satisfactory. Wood should be avoided in handling the stock or any other ingredients for vegetable soup, as it is difficult to keep properly sanitary and may be a source of bacterial infection.

It is advisable to remove any surface layer of fat from the stock immediately before use, and cold storage should be available to keep any stock or other products from one day to another. Meat extract can be used to reinforce the stock, but is not in great demand in the U.S.A. owing to its characteristic flavour; it is interesting to note that where meat extract is used the South American product is generally preferred from the point of view of quality and economy to the home-made product. Vegetable extracts of the Marmite type are not widely employed.

In addition to a bone and meat stock, a proportion of tomato pulp (up to 5 per cent.) is also used in the vegetable soup, with bicarbonate of soda to neutralise excess acidity if desired. Recently soups have appeared on the market in which the tomato pulp has been omitted, and the meat stock flavour predominates. Time will show whether this "meaty" vegetable soup is as popular as the characteristic tomato flavour of the old style soup.

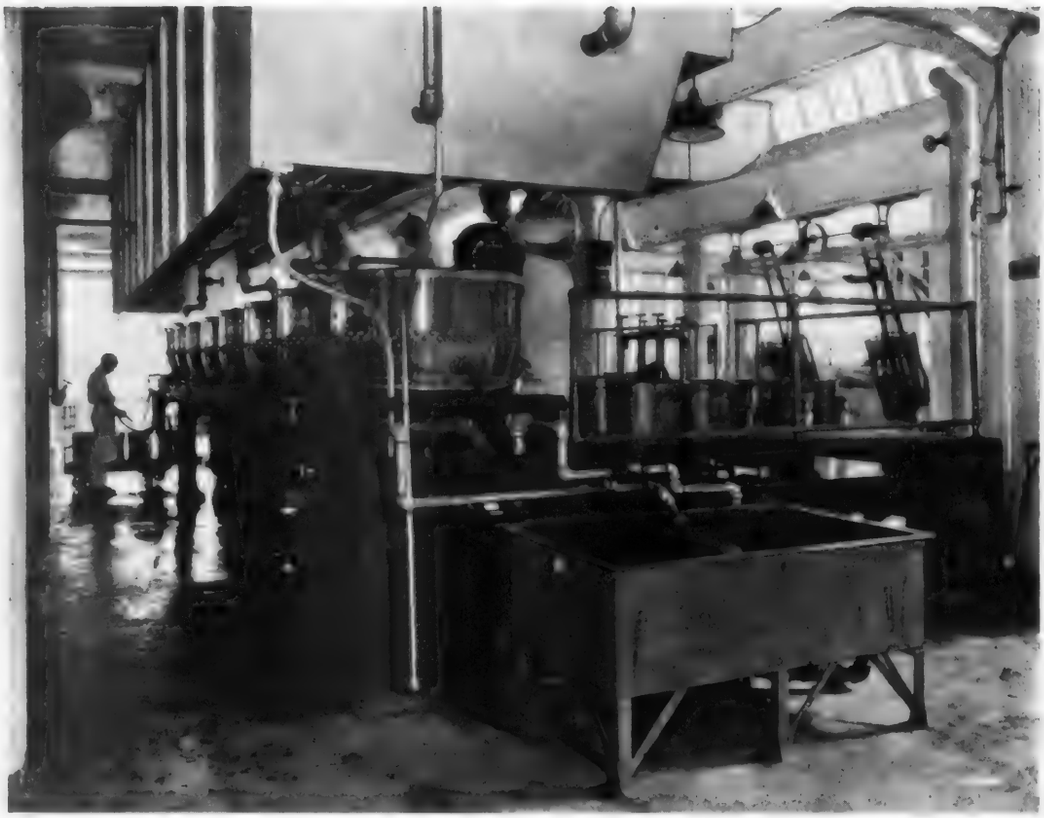
*Seasoning*.—The vegetable soup is in general very lightly seasoned. Sugar, salt, and pepper are added to taste, with frequently a dash of cayenne pepper and garlic; parsley, celery, thyme, sage, bay leaves, allspice, cassia, and cloves may also be used as aqueous extracts or essential oils. It is advisable at this stage to point out that the services of a skilled chef are almost indispensable to a manufacturer of soups. There is an art in the blending of the various seasonings and flavours which can only be acquired by training and experience. The actual production of the soup should be supervised by a food technologist, who must select the equipment to be used and provide for the handling of the raw materials and ingredients so that the chef's creation can be reproduced on a commercial scale. Due to the changes in flavour brought about by the sterilising process, it is usually necessary to modify to some extent any small scale recipe when it becomes a commercial production formula. Close co-operation is needed between the chef and the technologist to obtain the desired results.

It is essential to use high grade salt, pepper, and spices, as the cost of these ingredients is relatively unimportant but their bearing on the finished product is considerable. The thickening agent for vegetable soup is usually corn starch, wheat flour, or cracker meal, in proportions according to results desired.

The *preparation* of the vegetable soup is more or less straightforward, the ingredients being blended in a

*(Courtesy of the International Nickel Company.)*

**Part of Cook Room equipped with Steam Jacketed Kettles.**



*(Courtesy of the International Nickel Company.)*

**Blending Equipment.**

kettle, usually of nickel; thickeners and canned vegetables are added at the end, together with the spice extract. Sometimes it may be necessary to blanch carrots, turnips, or potatoes before adding to the soup, in order to remove some of the characteristic flavour; barley, rice, and noodles may be blanched to remove excess starch and prevent them from sticking together in the can. The soup is filled hot, usually by machine; the condensed soup is processed about fifty minutes at 240° F. for a 10-oz. can or seventy minutes for a 16-oz. can. Recently some manufacturers have produced a soup in which the various ingredients are assembled in the can without any previous cooking; the stock or soup is added and the whole of the cooking done in the can, and it is claimed that this procedure gives a superior flavour. This method of filling is probably advisable for a ready-to-serve soup where the thin consistency is likely to cause difficulty in obtaining uniform distribution of the ingredients.

## Chicken Soup

Chicken soup or broth is another popular variety. This consists essentially of chicken meat, together with rice, in a broth or soup made from the bones and carcasses of chickens, mildly seasoned with salt, pepper, celery, and parsley. Frozen chickens produced in the central part of the U.S.A. are used, and manufacturers generally prepare this line under the inspection of the Bureau of Agricultural Economics, in order to be in a position to assure the consumer that only sound healthy chickens are employed. All soups containing meat in the U.S.A. must be prepared under the supervision of the Bureau of Animal Industry. An inspector of the Bureau is present at all times when the soup is manufactured, and, in addition to approving the meat, he also supervises the preparation of the other ingredients. The Bureau has very strict regulations as to sanitation and general cleanliness, and this system ensures a product prepared under proper conditions.

All soups containing meats should be processed at 240° F. or higher; after processing, the cans should be cooled in water to 110° F. or lower before stacking or labelling.

Plain cans are generally used for vegetable soup, although a lacquered can will present a more attractive appearance when opened. A spray of hot water installed at the discharge end of the closing machine to remove excess soup, etc., will be found to be very helpful in producing clean bright-looking cans after labelling. Careful attention to detail of this kind results in a good-looking can containing a high quality product; with a reasonably low price the manufacturer is then ready to advertise and sell his soups. If we are to believe the example of the U.S.A., advertising and still more advertising is the road to success in selling canned soups as well as other products.

# SUGARY WASTES


## By A. G. NORMAN, D.Sc., F.I.C.

### Rothamsted Experimental Station


WITH THE great increase in the production and consumption of manufactured foods that has taken place in recent years, there has been a parallel increase in trade effluents of a sugary or starchy nature. The disposal of these wastes is often a matter of some anxiety. They may, of course, be run into the town sewers, but if the bulk is at all large the local authorities may demand a special rate. The whole elaborate procedure involved in sewage purification, and the analytical methods for the evaluation of "strength" or polluting character, have been developed for what is primarily a nitrogenous waste —namely, crude domestic sewage. If there is a high percentage of a carbohydrate waste mixed with the sewage, difficulties are likely to arise unless special precautions are taken. Brewery wastes, for example, give trouble in the purification plant of towns having a considerable number of breweries. A factory which has to dispose of a sugary effluent and is faced with a high local rate may find it more economic in the long run to erect its own plant to deal with it. The tendency of food industries to migrate to rural surroundings, for purposes of cleanliness or for the advertising value of a "factory in a garden," may often mean that the site is without an adequate local sewage system. In such cases, too, a special purification plant is necessary.

Common sugar is very available to practically all micro-organisms, and starch in any mixed natural population of micro-organisms is nearly as available. The problem of purification therefore resolves itself only into determining the best environment for the development of the micro-organisms. In this article will be given an account of the biological purification of one of the chief sugary effluents—namely, that from beet sugar factories.

A new development in industry is often productive indirectly of problems more or less unforeseen. For example, it is doubtful whether the Government which first provided for the subsidy on beet sugar fully realised the effect that their action would have on some of the rivers of this country. It was known then that the effluent from factories extracting sugar from the beet was of a polluting nature, but the difficulties and the magnitude of the problems with which local authorities and river boards were faced as a result of the erection of such factories must have been underestimated. In France, Germany, and the U.S., where the industry had been long established, attempts had been made to find methods of purification, but nothing satisfactory had been evolved, and in any case the necessity for purification was not in general so great, inasmuch as their factories are frequently on rivers of much greater flow, providing higher dilution. But so small are some of the rivers upon which factories were erected in this country that after a dry autumn the river virtually is diverted through the factory. The nuisance caused does not, of course, extend over the whole year, but neither is it confined to the six to ten weeks from the end of October when the beets are first lifted. The damage to the river may be serious and affect its condition for a much longer period. Perhaps it was especially noticeable inasmuch as many of the factories were established in rural districts on rivers hitherto unpolluted by industrial effluents. The symptoms were unmistakable: death of the fish, the growth of masses of algal slime, and some offensive smell in serious cases, due to the decomposition of the slime.

The plants for the sugar extraction are not all quite alike in design, but have their main features in common and are alike in needing large volumes of water. They are operated continuously day and night for the period of the "campaign." The beets arriving at the factory are "flumed" or transported in channels by flowing water to the washing machines, which remove the soil adhering and rootlets. A factory of average size dealing with 1,000 tons of beets per day will require from

*(Courtesy of The English Beet Sugar Corp., Ltd.)*

**Singling Young Sugar Beet Plants in the Field.**

(*Courtesy of the Lincolnshire Sugar Co., Ltd.*)

**Borsig Mud Filtration Plant.**

2½ to 3½ million gallons of water for transport and washing. This, after use, is heavily charged with clay and some beet débris in suspension, especially in frosty weather when the beets break up easily. At such times it may also contain some sugar in solution. After slicing, the beets are extracted in diffusers with hot water, either continuously or intermittently according to the process, and the extracted pulp pressed out in large filter presses. The exhausted pulp is at present dried and sold for cattle food. Incidentally, it is at least as good a source of pectin as apple pomace, and might find an outlet in that direction if the demand for pectin increased. It is the liquid from the pressing out of the beet pulp which is mainly responsible for the pollution of the river. In the continuous process the press water may be returned to the cylindrical diffusers, but this is not possible in the intermittently operated diffusers, and as a result press liquors to the amount perhaps of half a million gallons per day have to be disposed of. There is a further large intake and output of water from the factory in that required for cooling the condensers of the evaporators responsible for concentrating the sugar extract. This may be on the same scale, 3 million gallons or so per day, but, since it is not polluted or only very slightly so, it may be cooled and used again either for condensing or for the fluming and transport of the beet.

For every 1,000 tons of beets the factory thus finds itself every day having to dispose of perhaps 3 million gallons of flume water containing mainly soil in suspension, together with some beet débris, and up to half a million gallons of press water of a grossly polluting character.

The former, in general, does not give any serious trouble, since, by sedimentation in lagoons and screening, the suspended matter can be largely removed. Indeed, some factories have been able to reuse this water repeatedly for the same purpose. It is only necessary to have sufficient ponds to enable it to be held up long enough for sedimentation. Occasionally trouble arises in the lagoons from the fermentation of the beet débris. Acidic products are formed which remove some iron from the clay. In the reducing conditions set up, ferrous sulphide may result and the whole lagoon may go black. This condition may persist for some time, particularly during a warm spell, and then disappear as suddenly as it appeared.

The press water, on the other hand, contains almost exclusively organic substances in solution and suspension. Its composition may vary considerably according to the extraction plant, but it consists in part of cellular fragments and in part of the soluble beet constituents. The sugar content may vary from 0·1 to 0·2 per cent. or even much higher on occasion, so it will be seen that a factory may be putting into the river in its press liquor several tons of sugar a day. The effect of this on the biological processes in the river is disastrous. The sugar is rapidly fermented, large quantities of algæ and fungi appear, the bacterial count reaches astronomic figures,

(*Courtesy of The English Beet Sugar Corp., Ltd.*)

**Pile of Sugar Beet on Factory Storage Flume.**

and the dissolved oxygen in the river water falls to a minimum, with fatal results to the fish. The death of the fish was at one time ascribed to "poisoning" by saponin or some such toxic constituent of the beet. In fact it is nothing of the kind, and their death is simply due to asphyxiation, the micro-organic population of the water having removed all available oxygen. The problem of purification of this effluent is, therefore, the removal of the readily fermentable constituents which if put into the river would deoxygenate it.

The Water Pollution Board of the Department of Scientific and Industrial Research arranged for experiments on the treatment of this liquid to be carried out at the Rothamsted Experimental Station in 1927 under the direction of Mr. E. H. Richards and Mr. D. W. Cutler, and later, in co-operation with the industry, set up a semi-commercial scale plant at a beet sugar factory. There was in the first place very little to go upon in planning preliminary experiments. The whole wealth of experience of sewage purification was not of great value because, as mentioned previously, domestic sewage is primarily nitrogenous in character and press liquor primarily carbohydrate. Some Continental workers had claimed good purification from a double fermentation process, the first step being the production of lactic acid from the sugar, followed by liming and a second fermentation under alkaline conditions. Others had proposed biological oxidation on percolating filters, and this, in the end, was the method adopted, though a bio-aeration treatment, similar to the well-known "activated sludge" process for sewage, was also investigated and found to be partially successful.

A filter is not a filter in the ordinary sense of the word when it is a percolating filter, and the gravel or clinker in it merely acts as support for a film composed of innumerable micro-organisms. To purify a solution by biological oxidation on a percolating filter means that the vast microbial population oxidises away any available nutritive constituents in the solution as it slowly trickles through the filter. Sugar is an ideal food for practically all types of organisms and is rapidly fermented away, first to acids and then to $CO_2$ and water. A sugary solution poured over such a filter will decrease in concentration as it passes through, and, if the conditions are satisfactory, the effluent will contain no sugar at all. This is the process of purification which has been devised for the sugary press liquors from beet factories. It substitutes a controlled oxidation in a filter for the uncontrollable and deleterious oxidation in the river. Now since the press liquor does not consist only of sucrose in solution, but contains also suspended particles and cellular residues, a percolating filter in this case does have some straining or filtering action, and there occurs within it, besides the oxidation of the dissolved materials, a mechanical separation of suspended particles and a flocculation of colloidal matter. These deposited substances, if organic, are similarly decomposed and oxidised away by micro-organisms, and any clogging effect that they might have is thus counteracted. A study of the types of organisms active in the filter and comprising the film over the surface of the medium, or feeding on the film, has shown that it is an extraordinarily complex community and not dissimilar to that occurring in sewage filter. At the beginning of the campaign, and particularly if the filter has only recently been constructed, it is merely a heap of clinker or gravel. If press liquor is run through it, percolation is rapid and the degree of purification obtainable as measured by the decrease in B.O.D. (Biological Oxygen Demand*) is small. Day by day the degree of purification obtainable will increase gradually as an active film of organisms develops at the expense of the nutrients in the liquor fed to the filters. For their development and growth micro-organisms require two types of food material—(*a*) energy-

* This is a titration or expression of the oxygen utilised during a five-day incubation test.

*(Courtesy of The Lincolnshire Sugar Co., Ltd.)*

**Brigg Factory.**
**End of Beet Bins in Foreground with Piles of Limestone behind.**

supplying material, such as carbohydrates; and (*b*) structural constituents, such as nitrogen, phosphate, etc., for essential protoplasmic building processes. The press liquor contains some protein and phosphate—more than enough, in fact, to maintain an established film, but hardly sufficient for the growth and development of the film at the beginning of the campaign. The addition of nitrogen in some form or other, phosphate, and other mineral salts might be advantageous at that time, even though it has been shown to have no significant effect when the film is once established. The initial inoculation of filters with chosen organisms or with medium from an active filter is not noticeably beneficial, inasmuch as the press water itself and the river or flume water with which it is commonly diluted before treatment on the filter are amply supplied with all types of soil micro-organisms. In a sugary medium the conditions are so suitable for the development of most organisms that it is unlikely that any particular type would become dominant.

Many technical questions had to be settled before a large-scale plant could be operated successfully. The size of the filter medium must be small to give maximum surface and efficiency, but not so small that choking occurs. For obvious reasons the rate of application of the liquid must be as fast as will give good purification, and this rate will vary with the condition of the filter. The best concentration of sugary effluent to apply to the filters had to be determined, together with such points as whether it is better and more economical to filter a strong liquor slowly or a dilute liquor fast. On the basis, first, of small-scale laboratory experiments using filters made of drain pipes, and then of a semi-commercial scale plant, it is recommended that filters should be made about 6 feet deep and composed of insoluble slag or gravel not less than $\frac{3}{8}$ inch nor more than 1 inch in size. The factory press liquor should be diluted to give a sugar concentration of about 0·1 per cent., and after holding up for a while to sediment out any gross suspended solids should be applied to the filters at a rate of about 100 gallons per cubic yard of filter medium per day. Under such conditions, if the filter is mature, the effluent should be entirely non-polluting and innocuous. It need not be discharged into the river, but may be re-used in the factory either as flume water or for the dilution of further press water. There is no evidence for the accumulation of harmful by-products if this is done, though the concentration of nitrogen in solution may increase.

Based on the work which was carried out on a semi-commercial scale, a full-sized plant has now been erected as an integral part of the plant of a large beet sugar factory, and the whole of the effluent from the presses can be satisfactorily dealt with in this way by oxidation in percolating filters.

It is sometimes possible to solve a problem by accident or by a trial-and-error method, and, although there may be satisfaction in the solving, that cannot be so great as if the "why" is understood as well as the "how." The aim of the research group which worked on this problem was not merely to find a method for the purification of the waste water from a beet sugar factory, but also to study fundamentally some of the changes, both chemical and microbiological, taking place in the filters. Much of the information gained has a direct bearing on a wider field than the purification of beet sugar effluents, and may be applied to the treatment of other sugary wastes in which the technical difficulties are likely to be considerably less. Jam factory waste, for example, closely resembles press liquor in analysis, and has been successfully treated by biological filtration by more than one large concern. Every case requires consideration on its own merits, but now that the fundamental processes involved in the oxidation of carbohydrates have been worked out, there is information available upon which a decision as to the design of plant can be made and an estimate formed as to the economics of the purification or partial purification required.

*(Courtesy of The Lincolnshire Sugar Co., Ltd.)*

**Hand-Hoeing the Growing Beet.**

# The Manufacture of Continental Sausages

By PETER SALOMAN, Diplom. Eng.

THE CONSUMPTION of Continental sausages has, during the last few years, increased continuously in this country, but difficulties have arisen owing to the lack of knowledge and experience in the manufacture of these products.

Continental sausages may be conveniently grouped into two main classes—(1) Scalded Sausages (Short Scaldings) prepared by the hot smoking method, and (2) Raw Sausages prepared by the cold smoking method. In order to carry out successfully the manufacture of these sausages, it is essential to have a clear understanding of the theoretical principles involved and to be able to follow intelligently the various changes which take place, or are liable to take place, in the chemical composition and the physical nature of the skin and meat of the sausages.

## The Scalding and Hot Smoking Method

Scalded sausages include:

| | |
|---|---|
| The Frankforter, | The Knobländer, |
| The Vienna, | The French Sausage, |

and several other kinds, differing in size and composition.

Both mincer and bowl chopper are used in the preparation of the sausage mass. The former is used for mincing the meat, and the latter for chopping and mixing together all the ingredients. On the Continent the plant used for this purpose is on a larger scale than is usually the case in England, and it has always been found to give excellent results, without, for instance, imparting any greasy character to the sausage mass.

The stuffing process is usually carried out on the Continent by Automatic Portion Sausage Stuffers, which fill all the sausages with an equal and constant weight of meat and thus effect a considerable economy in time over that required for twisting the sausages by hand. After leaving the filling machine the sausage has a wet skin, and the meat which it encloses is grey and pulpy. During the hot smoking treatment which now follows several reactions take place, partly simultaneously and partly in stages.

*Drying the Skin.*—Drying is the first process in the smoke stove. In order to prevent the skin becoming tough, the drying process must be continued only until the skin has attained a certain sticky feeling. During the subsequent treatments the drying process continues, and at the same time, also under the influence of heat, the meat undergoes the pickling process as explained below.

*Pickling the Meat.*—It may be accepted that the liquid in the meat mass has been extracted by the hygroscopic character of the salts (including saltpetre) which have been added to the mixture. This liquid will have accumulated in the tissues, and, together with the soluble albumen, will have formed a colloidal solution which coagulates at about 113° F. (45° C.). The pickling process results in the appearance of a natural appetising red colour, thereby dispensing with the use of any artificial colouring matter. This effect is induced by the saltpetre acting on the hæmoglobin, the red colouring matter of the blood, which now also forms a part of the meat juices accumulated in the tissues.

For practical purposes this reaction may be considered to take place only above a temperature of approximately 43° F. (6° C.). The development of the red colour then becomes more intense the higher the temperature, but it is practically arrested above 113° F. (45° C.), at which point the protein matter coagulates. It follows, therefore, that the processes of drying, smoking, and pickling described above have to be carried out under conditions which do not allow the meat to attain a higher temperature than 113° F.

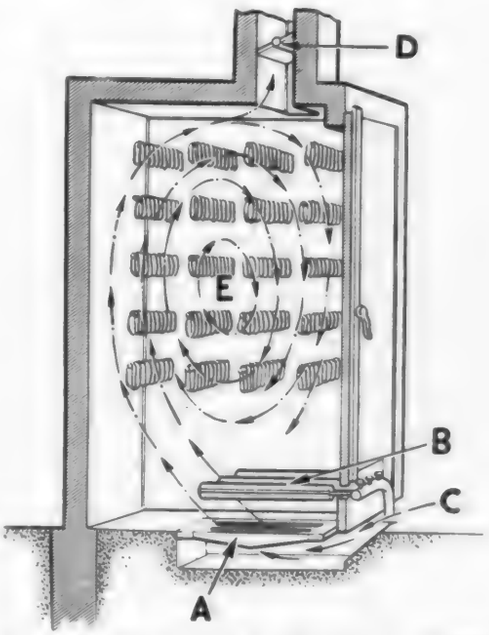



FIG. 1.—A, Smoke grate; B, gas burners; C, secondary air enters here; D, damper; E, "dead" air pocket.

## The Overheating Process (Überhitzungs-Prozess)

When the required intensity of colour has been obtained, the temperature of the meat must be raised to above 45° C. This is known as the "overheating" process, and its function is to put an end to the pickling process and to coagulate the proteins. The effect of this is to bring about an increase in the volume of the meat, which causes tightening of the skin. The process can be carried out either in the stove itself or in hot water or in steam chambers. The method selected depends on whether the sausages are to be sold canned or fresh.

Sausages to be canned are filled, together with brine, into the tin. The brine makes the skin more tender and reduces the smoky taste and colour. Meanwhile the increased volume of the meat is slightly reduced. The canned sausages must therefore be more strongly smoked, which is done by moistening the chips of wood used for smoking. The effect of the brine in reducing the volume of the meat must be neutralised by overheating the sausage as much as possible, bearing in mind the tensile limit of the skin. This overheating must be watched very carefully, because once the limit is reached the whole charge may burst within a few seconds. The operation can therefore only be carried out in a smoke stove which allows constant supervision of the skin-tightening process.

Fresh sausages, however, are overheated in hot water

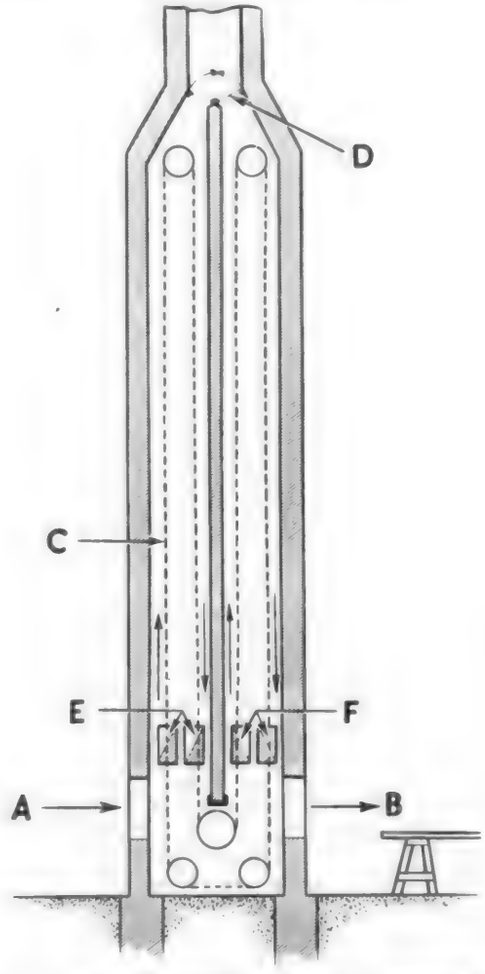



FIG. 2.—A, Sausages charged into tower at this point; B, sausages discharged at this point; C, chain conveyor for sausages; D, damper; E, ports of flues through which hot air from independent gas or wood heated furnace enters smoke tower; F, ports of flues through which smoke from independent smoke generator enters smoke tower.

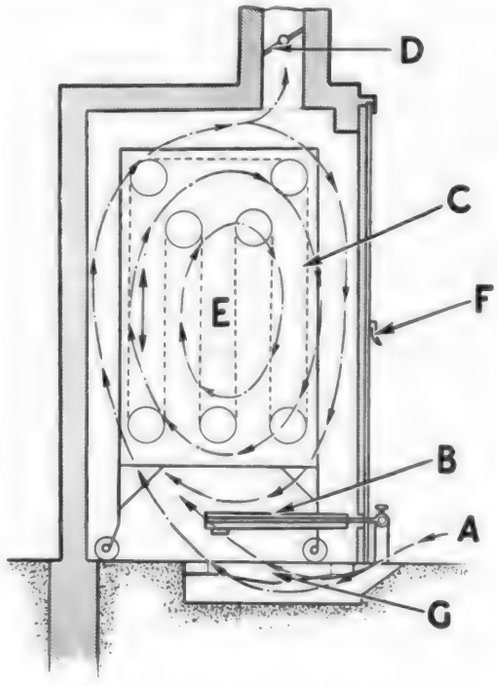



FIG. 3.—A, Secondary air enters here; B, gas burners; C, chain conveyor for sausages; D, damper; E, "dead" air pocket; F, iron door; G, smoke grate.

near the boiling point but not actually boiling because of the danger of bursting. As an alternative they may be overheated in the steam chamber, which eliminates the danger of bursting.

In order to obtain a tender skin it is necessary to shorten the time of treatment in the smoke stove as much as possible. This time cannot be shortened by a higher working temperature, for reasons already given, but, on the other hand, the drying has to be very carefully carried out, for if excessive volumes of air are employed or if the air circulation is too vigorous there is danger of the skin becoming too tough. These conflicting requirements impose particularly severe conditions on the structure of the steam stoves. Moreover, further complications are introduced by the fact that uniformly good results must be guaranteed, even though large batches of sausages are under treatment.

Three main smoke stove systems have been developed on the Continent to comply with these conditions:

1. Stationary Smoke Kiln. (See Fig. 1.)
2. Smoke Tower Stove. (See Fig. 2.)
3. Conveyor Smoke System (Wanderrauch Verfahren). (See Figs. 3, 4, 5.)

FIG. 4.—Trolley loaded with Sausages.

1. The *Stationary Smoke Kilns* are usually built with a capacity of about 400 pairs of sausages and have a volume of about 5 cubic yards. They are mostly operated on the internal circulation principle (Fig. 1), the average working time for a charge being seventy-five minutes; they may be heated either by gas, wood, or hot air. The advantage of this construction is the small capacity, which makes these stoves very useful in factories where several brands of sausages are to be produced together. Their disadvantage is the high consumption of fuel and the attention they require, and also the risk of damage by lack of uniformity of output, easily caused by the irregular distribution of air currents in the stove. If they are not exceptionally well constructed, waste cannot be avoided even by skilled workers.

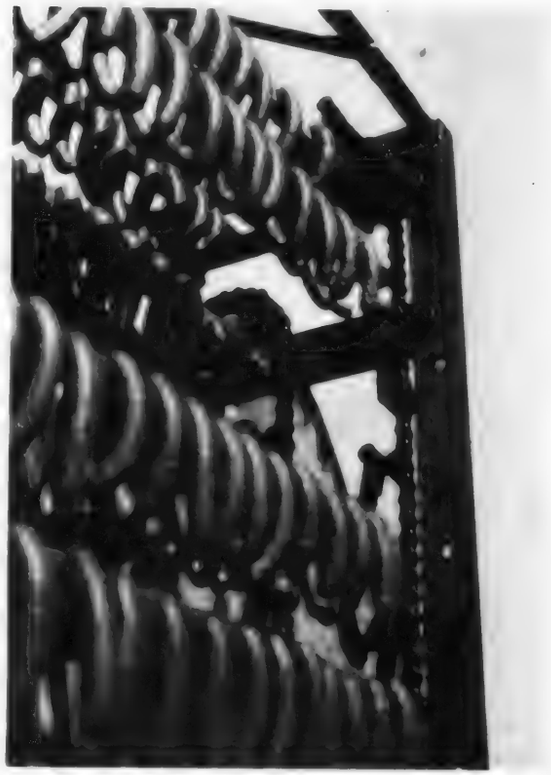
2. In the *Smoke Tower Stove* the goods are generally conveyed up and down a tall, narrow compartment (Fig. 2). Its advantage is the uniformity of output obtained, and the plant may be used for smoking every kind of meat product. Its disadvantage is that it is expensive to construct. Furthermore, these stoves are only suitable for mass production on a large scale, and they are not sufficiently adaptable to the sudden changes which are customary in the manufacturing programme of most concerns. They are not, therefore, so frequently found on the Continent.

3. The *Conveyor Smoke System* not only combines the best points of both systems mentioned above, but also turns to advantage one of the worst features of the stationary smoke kiln. The sausages are hung on wooden rods carried by travelling chains fixed on a trolley which is run into the stove, and the goods circulate slowly through the chamber in the manner shown in the diagram (Fig. 3).

It will be seen that the sausages experience on their circuit an alternation of dry and moist conditions. Thus they pass on their journey through the hottest zone at the base of the stove (usually termed the "fire zone"), where the skin becomes dried. Then they traverse the "neutral zone" situated at the centre of the chamber where the air is practically dead and where it is relatively humid, and so the skin again becomes moistened. From here the sausages pass into another drying zone in the upper part of the chamber and then down again through the neutral zone into the "fire zone." This frequent repetition of drying and moistening gives a skin smoother than can be obtained by any other kind of treatment. Moreover, each sausage receives the same treatment and remains only for a short time in the hottest and dryest part of the stove. This permits the application of a higher stove temperature and reduces the working time by about 30 per cent., which is a very important feature so far as the tenderness of the skin is concerned.

In comparison with the stationary type of smoker, this method gives three or four times as much output per unit. The drive is outside the chamber, and several units may be linked up. The mere placing of the trolley in the chamber connects up the chains with the drive.

FIG. 5.—Close-up View.



(*A continuation of this article will appear in the next issue.*)

# The Pasteurisation of Milk

## and its Relation to Health

By Elliot B. Dewberry, M.R.I.P.H., M.R.San.I.

MILK DIRECT from a healthy cow is probably the cheapest and most perfect food known, and the large increase in its consumption has been a marked feature during the past twenty-five years. It has been estimated that the total output in Great Britain now amounts to more than 1,000 million gallons per annum, 73 per cent. of which is probably consumed in the liquid form.

The question of the production of an adequate pure milk supply is one of national importance, and the subjects of pasteurisation and the eradication of bovine tuberculosis have never before excited so much interest among medical officers, health officials, agricultural and educational authorities, and the public generally, as at the present time.

Milk is well known to be an excellent medium for the growth of germs, both harmful and helpful, and is the one food likely to convey them into the human body. This is partly due to the fact that it is sometimes obtained from diseased animals, and partly to the fact that unless adequate precautions are taken it may easily become contaminated and infected in various ways—*i.e.*, during collection, transportation, storage and delivery, and last but not least, in the home of the consumer.

The dairy farmer formerly disposed of the milk from his cows in the immediate neighbourhood, and it was consumed a short time after delivery. Later, however, he sent it many miles, and in all probability thirty-six hours or more elapsed before it was consumed, during which time it was liable to be exposed to dangers created by ignorance or carelessness; moreover, the milk was sometimes mixed at receiving depôts with that from other dairies, and in this manner contamination or infection from one source spread throughout the bulk.

During the long journey in summer time the milk often turned sour. This was temporarily overcome by the use of preservatives, but the issue of the Public Health Preservative Regulations put an end to this method. To improve the keeping properties of the milk it became necessary to collect it under greatly improved and hygienic conditions; processes of straining and cooling were introduced, but all this was found to increase the cost of production, and in consequence dairy farmers became very reluctant to undertake the delivery of milk at all.

As the general demand for milk increased and, with the growth of the wholesale milk trade, more suitable and rapid methods of transport became available, the difficulties were gradually overcome and it was found possible to transport the milk in bulk from remote country districts to urban centres. The problem then arose as to how clean raw milk could be treated to preserve its keeping properties for a reasonable period without altering its food value or greatly increasing its cost, and at the same time minimise the risk of milk-borne disease. It was suggested that the process of pasteurisation was probably the answer. At first it was thought that complete sterilisation was necessary for the destruction of the germs and spores, etc. — *i.e.*, heating the milk

CLARIFYING

(*Courtesy of United Dairies.*)

from 115° to 118° C. for fifteen to twenty minutes; it was found, however, that the destruction of all harmful germs commonly transmitted through the agency of milk, such as diphtheria, typhoid fever, scarlet fever, etc., could be accomplished at a much lower temperature. Heating the milk to these high temperatures caused considerable physical and chemical changes.

Pasteurisation is not a new process, for Louis Pasteur carried out experiments many years ago on the spoilage of wine and beer and the temperature of heating necessary to prevent abnormal fermentation. In 1886 the scientist Soxhlet advocated the application of the method to milk.

## The Pasteurisation Process

Pasteurisation may be defined as a process of heat treatment primarily designed to destroy germs, harmful to man, which may be present in milk, and to reduce or arrest the growth of other germs which, although harmless, cause the milk to go sour, without at the same time appreciably altering its physical and chemical characteristics. During the process a great reduction occurs in the number of lactic acid bacilli, which allows the milk to keep fresh longer than raw milk. It must be remembered, however, that there are still many of these organisms which are not destroyed, and in consequence the milk sours in the ordinary way. It has been argued by some authorities that this destruction of lactic acid bacilli and consequent delay in souring makes it all the more necessary adequately to cool the heated milk and afterwards protect it from unnecessary exposure to harmful germs, as these are more likely to multiply unchecked in the treated milk than in ordinary raw milk. Opinions, however, differ on this point. In any case, pasteurisation is not a safeguard against further contamination. From the year 1900 pasteurisation of milk became more extensively employed as a trade expedient. Large quantities from rural districts were sent to depôts where the milk was bulked, transferred by rail or road in glass-lined tanks, and afterwards pasteurised and distributed.

In 1923 the Milk (Special Designations) Order came into force, which provided for the grading of our supplies. Pasteurised milk was among the grades sanctioned in this country under a licensing authority. The following are the conditions laid down for carrying out the "Holding" method of pasteurisation, which is the one in general use:

1. The milk must be retained at a temperature of not less than 145° F. and not more than 150° F. for at least half an hour, and must be immediately cooled to not more than 55° F.

2. The milk shall not be so heated more than once and shall not be otherwise treated by heat.

3. The type of apparatus used for pasteurisation and the methods employed shall be such as are satisfactory to the licensing authority.

4. Every vessel containing the milk shall be labelled "Pasteurised Milk".

5. After pasteurisation and before delivery to the consumer the milk shall be found to contain not more than 100,000 bacteria per c.c.

Between the years 1919 and 1927 nearly the whole of London's methods of milk distribution changed from the churn and measure to the bottle. In Greater London the proportion of ordinary milk pasteurised exceeds 90 per cent., and approximately twelve million bottles are in use in London and its suburbs daily. In Edinburgh approximately 24,000 gal. are consumed daily, of which 60 per cent. is pasteurised. In Glasgow, out of about 65,000 gallons consumed daily, two-thirds is pasteurised. This illustrates the position of the general supply of milk as regards pasteurisation, which has, of course, been developed and widely adopted by the milk industry for commercial reasons.

## Objections

There has always been a great deal of discussion as to the efficacy of pasteurisation, and many specialists have strenuously opposed its application to milk for infants. Generally speaking, the chief objections raised against pasteurisation are:

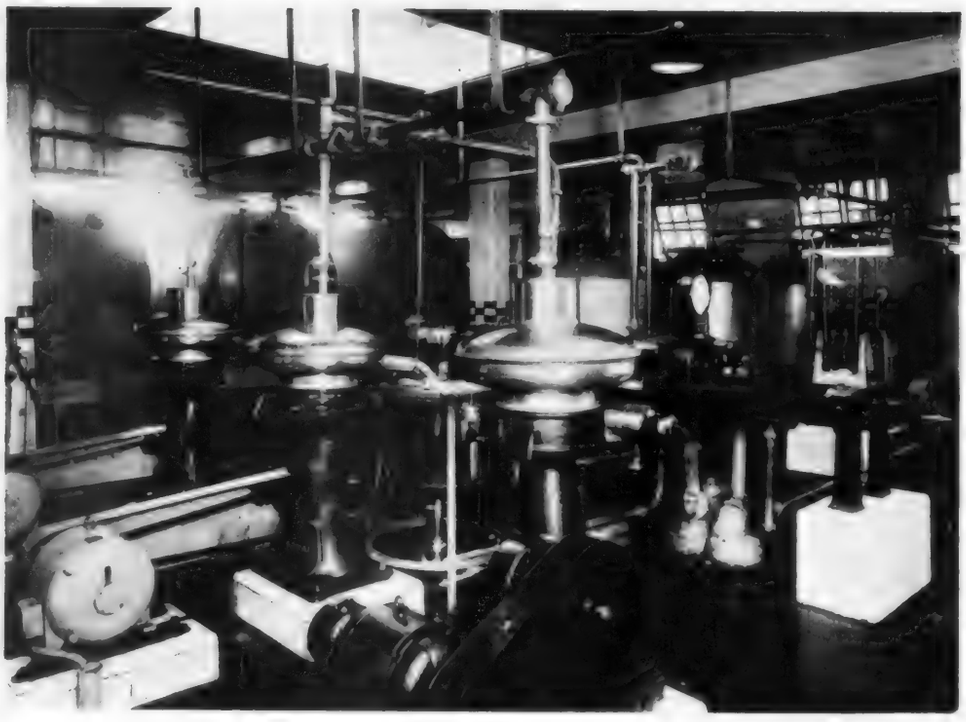
(*a*) That it seriously impairs the nutritive properties of raw milk, rendering it unsuitable for feeding babies and children.

(*b*) That the process does not kill the bovine tubercle bacillus.

(*c*) That if pasteurisation of milk were made compulsory the dairy farmers would have no incentive to

LABORATORY

(*Courtesy of United Dairies.*)



CLARIFYING

(*Courtesy of United Dairies.*)

produce clean milk. That is to say, it facilitates the disposal of unclean milk, and, although pasteurised milk will sour, this occurs much later, and in consequence stale milk might be sold as fresh milk.

### Discussion of the Objections

These objections may be met as follows:

(*a*) A very large number of investigations and experiments on the effects of heat on milk, especially with regard to its nutritive properties, have been going on for many years, with the following results:

In efficient pasteurisation by the "Holding" method (*i.e.*, accurate adjustment of time and temperature) it has been proved that hardly any appreciable physical or chemical changes occur in the milk, as the odour, taste, and flavour are but little altered (there is no cooked taste or smell). The amount of visible cream which rises to the top of the milk on standing is scarcely affected at all, especially if the milk is sufficiently cooled after heating. No destruction of the milk sugar occurs, but there is, however, a small reduction (about 5 per cent.) in soluble calcium and phosphates; no appreciable change takes place in the proteins. There is no evidence that pasteurisation destroys the vitamins to any appreciable extent, with the exception of vitamin C, this being sensitive to heat. To compensate for this lack of anti-scorbutic properties it is usual to give orange, tomato, or swede juice, preventives of infantile scurvy, and in addition, if considered necessary, cod liver oil. It is well known that the vitamin content of raw milk is variable, and consequently neither raw nor pasteurised milk is a complete source of accessory food factors for infants.

In a review of the existing knowledge of this subject by the Hannah Dairy Research Institute, Scotland, 1933, the investigators state: "There are, therefore, strong grounds for the belief that infants can satisfy all their requirements on diets of adequate amounts of pasteurised milk, provided that extra vitamin D and, of course, vitamin C are added to the list." And again, commenting on the properties of raw and pasteurised milks: "There do not appear to be any good grounds for the belief that pasteurised milk is a less valuable component of the diet than raw milk for children who satisfy the bulk of their nutritive requirements from sources other than milk." It has been stated by some that pasteurised milk does not agree with all children, but recent extensive feeding experiments have shown that it is as well borne by them as raw milk.

(*b*) Regarding the great problem of bovine tuberculosis which has been and is still so much debated, the presence of tubercle bacilli in the milk supply is, of course, well known, and statistics for this and other diseases due to infected milk have been published from time to time by the Ministry of Health. The incidence of this dread disease, which for years was a national scourge among children, has shown a continuous marked decline. In his work on *Tuberculosis of Bovine Origin* (1929) Dr. W. G. Savage says: "While tuberculosis infection may be conveyed by many vehicles, it is to milk, and in the main liquid milk, that we must look as the predominant carrier of bovine tubercle bacilli in man. If we can eliminate this source of infection, most of our bovine infections will disappear. If we take infection with the tubercle bacillus as the criterion of tuberculosis, the dairy herds of this country are very extensively affected, and

40 per cent. would seem to be a conservative figure." And, further: "It is better for those concerned with the human infection side to face their own problem in their own way and to leave bovine tuberculosis to those concerned with animal diseases and to protect the milk supply by an efficient and adequately controlled system of pasteurisation."

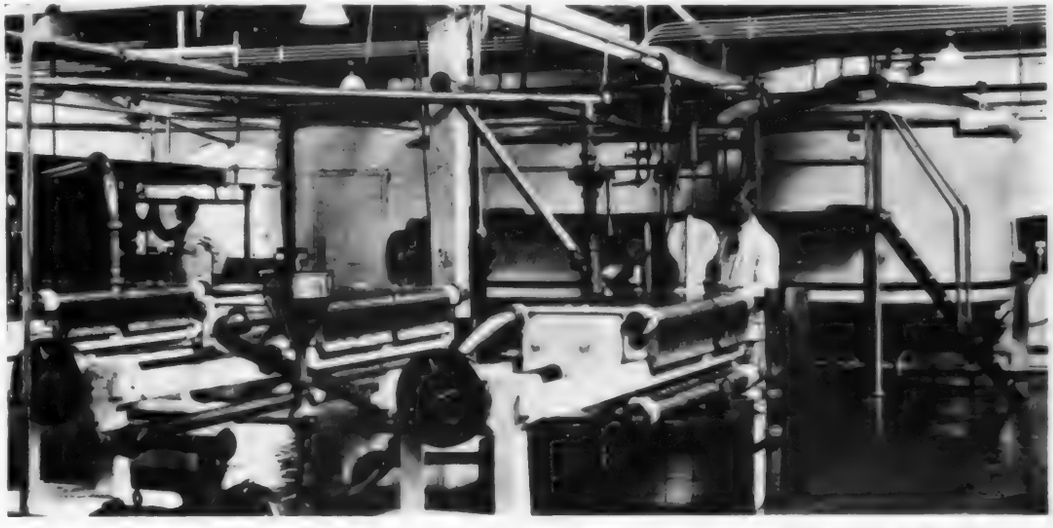
Many experiments have been carried out to investigate the effects of the time-temperature factors on the destruction of tubercle bacilli in milk, and the results show that the tubercle bacillus is destroyed or rendered harmless in the process of pasteurisation, provided it is efficiently carried out by the "Holding" method. In a pamphlet on Pasteurisation issued by the Ministry of Health (1923), Dr. J. M. Hamill remarks that "It is possible under certain conditions that a small proportion of tubercle bacilli may escape actual destruction, but their virulence appears to be so impaired as to make them harmless. Pasteurisation therefore affords a simple means of rendering milk reasonably safe as regards risk of transmitting disease." The elimination of tuberculosis from dairy cattle is most certainly the ideal objective, but this end can only be attained very slowly. That it is possible has been shown by the recent work on an experimental scheme for the eradication of bovine tuberculosis by Dr. L. Jordan, of the Hannah Dairy Research Institute. The Research Council, referring to the results, state: "Eradication of tuberculosis from heavily infected herds is by no means an insoluble problem, and it demonstrates clearly the tuberculosis eradication which can be achieved by providing the relatively small incentive of free tubercle testing and free expert advice."

There is still among dairy cattle a high incidence of tuberculosis, and consequently a concensus of opinion exists that efficient pasteurisation of milk should continue in order to protect the public from this milk-borne infection.

(*c*) The allegation put forward that pasteurisation facilitates the disposal of dirty milk has long done duty as an objection to the process. The Director of the Hannah Dairy Research Institute, in his recent pamphlet on compulsory pasteurisation (1933), remarks: "There appears to be no justification for assuming that compulsory pasteurisation will inevitably result in a set-back to clean milk production. In any event, any such retrograde movement could be prevented by the inclusion of suitable pre-pasteurisation standards in pasteurisation licences, a course which has been adopted with success in many American cities." The enforcement of the various Milk Acts and regulations by local and county authorities should be sufficient to ensure that all milk is reasonably clean before it is pasteurised. The process is not a substitute for, but an adjunct to, inspection; the latter gives a cleaner but not necessarily a safe milk; the former destroys the danger that inspection cannot see. It has been shown that pasteurisation is not and never can be a substitute for cleanliness in dairy farms, and recent work by E. B. Anderson and L. J. Meanwell demonstrates clearly that clean methods of milk production exert a great influence on the suitability of milk for pasteurisation, while dirty methods lead to serious difficulties in the treatment by heat.

In conclusion, without doubt the general cleanliness and the quality of the milk as shown by bacteriological examination and chemical analysis has improved considerably during recent years, due, on the one hand, to supervision of a helpful nature on dairy farms, frequent veterinary inspection, and the carrying out of the various milk regulations, and, on the other hand, to the influence of distributing firms and the increasing interest of producers.

With regard to pasteurisation, it may be of interest to quote from the Ministry of Health memorandum on "Bovine Tuberculosis in Man" issued in 1931: "The problems and procedures of pasteurisation have been reviewed, and it has been shown that, subject to careful operation and scientific control, this process ensures a milk which is not only safe for consumption, but also retains its food value practically unimpaired by the heat to which it is subjected."



PASTEURISING

(*Courtesy of United Dairies.*)

# THE FLUORESCENCE ANALYSIS OF FOODSTUFFS

VARIOUS MATERIALS when irradiated with specially filtered ultra-violet light show marked fluorescence, and the colour of the fluorescent light is in a very large number of cases characteristic of the particular substance under examination; substitutes or imitations will not as a rule fluoresce in the same way, and adulterants are readily detected by a dilution or change of the colour. Consequently the analytical quartz lamp (mercury vapour) is being increasingly used in industry, manufacturers finding that it is often capable of giving the equivalent of a lengthy analysis, or, at least, all the information required, in a few seconds. Moreover, even in those cases where chemical and/or physical tests are indispensable, the evidence obtained by fluorescence analysis is frequently of value as a supplement to such tests.

Fluorescence analysis is capable of application in many branches of the food industry.

## Jams and Sugar

Thus, according to a correspondent in the *Manchester Guardian Commercial*, apple pulp can be detected in raspberry, strawberry, gooseberry, and other jams, and turnip pulp, sucrose, molasses, and glucose can be detected in sugar pulp. Sugar quality can also be evaluated by examination under filtered ultra-violet light, and a "fluorescence scale" may be made up by adding successively larger amounts of impurities to pure sugar. Differences corresponding to 0·001 per cent. of ash content are easily recognised, says this correspondent.

Concerning the testing of sugar solutions this writer says: "When sugars are tested in solution even the minutest trace of sugar colouring can be recognised, as solutions of pure sugar absorb ultra-violet rays to a very small extent, but coloured solutions very strongly. Milk sugar, glucose, and grape sugar appear reddish; glucose syrup has a distinct bluish fluorescence, but molasses none whatever. Bluish fluorescence in a sugar solution containing fruits indicates the presence of glucose syrup. Saccharine shows a greyish colour under the lamp, but the addition of sodium hydroxide solution gives an intense violet fluorescence. It is found that the purer the cane sugar the more pronounced is the violet colour."

## Flour

Very useful data relating to the composition of flour can be obtained by fluorescence analysis, flour from wheat or rye giving a faint blue fluorescence, whilst that from potato or barley gives none at all; consequently the addition of the latter to flour to be used for making bread can be detected by diminution in the intensity of the fluorescence emitted. The *Manchester Guardian Commercial* writer goes on to say: "Pea meal shows red and bean meal a greenish blue, and as little as 2 per cent. of these added to wheat flour can be detected. As little as 0·3 per cent. of zinc oxide is easily seen in flour, and 1 per cent. of soya-bean flour gives a pronounced difference in the fluorescence. Wheat giving a good flour and with a high gluten content gives the characteristic bluish fluorescence, while inferior wheat has a yellowish colour."

## Fats

The various fats emit fluorescent light of characteristic colours when subjected to filtered ultra-violet light, and butter, margarine, lard, mutton fat, etc., can readily be distinguished; furthermore, 15 per cent. of margarine added to butter can be detected by this means. "White grease", the highest grade of inedible hog fat, gives a very characteristic fluorescence, and it has been claimed that as little as 0·001 per cent. of it can be detected with certainty in other fats.

## Cheese Ripening

Important information concerning the ripening of cheese can be derived from examination under ultra-violet light; cheese when freshly prepared shows a yellow fluorescence on irradiation, and this changes to blue as the degree of ripeness increases. As the writer already quoted points out, the method is particularly applicable to the examination of gorgonzola and Roquefort cheeses, for living fungi give a brilliant green fluorescence which is not shown by dead fungi.

It is quite certain that fluorescence analysis will be more and more used as recognition of the possibilities inherent in these tests becomes more widespread. The accumulation of further data relating to particular branches of industry will greatly increase the usefulness of the method, though even in the absence of published information it is, of course, still possible to make the tests "comparative", retaining samples of standard or known composition or satisfactory performance; much of value has already been done in this way, and it is usually desirable in any case to keep standard samples when this is possible.

# THE INSECT PROBLEM AND THE FOOD MANUFACTURER

**By F. R. Passmore**

(Mr. F. R. Passmore, writing from the Imperial College of Science and Technology Biological Field Station, Slough, deals with a subject which is becoming of increasing importance owing to the lack of any organised scheme of prevention or control.)

Grain Weevil on Wheat.

THERE ARE few people engaged in the manufacture, preparation, or packing of foodstuffs who have not been troubled in some degree by the depredations of insects; mills, factories, and retail stores, anywhere where quantities of food are stored, either in the raw material or manufactured state, the danger of insect infestation is always present. Unfortunately, it is a danger which is often quite unrealised even by those most nearly affected. Insect infestation of marketable goods does not, very naturally, receive much publicity, and anyone who is unfortunate enough to discover that his own goods, or those in his charge, contain undesirable livestock is apt to regard the occurrence as isolated and unusual.

During the writer's experience in the survey branch of that section of the Entomology Department of the Imperial College of Science and Technology devoted to the study of " stored products " insects, many enquiries from firms who are troubled with insect pests have been investigated and a host of different infested products have been examined. One result of these investigations is to leave no doubt tnat infestation by insects is widespread. Furthermore, since there is little or no attempt at organised prevention or control in this country, the danger is increasing. The insects are becoming, in the course of time, more firmly established, and the range of commodities which they damage is widening.

The particular types of insects which live on stored foodstuffs are seldom or never found on the produce when it is growing. Unlike the majority of field insect pests, they have become adapted to a diet containing small amounts of moisture and to an indoor life. The most typical and perhaps the most troublesome are members of the moth family Phycitidæ, *Ephestia elutella* (the cacao moth), *Ephestia cautella* (the fig moth), *Ephestia kuhniella* (the Mediterranean flour moth), and *Plodia interpunctella* (the dried fruit moth). Thought to have been originally tropical or subtropical, these moths have become, through the increasing transport facilities of the last hundred years, so widespread that they are now practically cosmopolitan. They are able by hibernating to over-winter in temperate climates, so that a European warehouse, by constantly importing produce containing the live insects, may itself become permanently infested and thus a danger-point liable to infect a factory which it in turn supplies.

The range of foods upon which these insects can thrive is astonishing; there does not seem to be a stored product to which one at least of these species cannot become accustomed. As an example of how they spread, perhaps the outbreak of the cacao moth in stored tobacco leaf about six years ago can be cited. As a tobacco pest this insect seems first to have been noticed in this country infesting bonded stocks of Empire tobacco, with which it had presumably been imported. About the same time it made its appearance in the U.S.A., and the infestation spread like a virulent disease throughout the curing sheds and stores of the American tobacco belt. The financial loss to the industry throughout the world during the last few years has been enormous. Only the best type of cigarette leaf is affected; the fertility of the insect and its rate of multiplication are very great, and the only effective control is the expensive one of fumigation.

When foodstuffs are attacked the story is the same; the outbreak is unexpected and its spread rapid, but the cure is always a slow and costly business. Thanks mainly to the work of Drs. Page and Lubatti, of the Imperial College of Science and Technology, fumigation as a control for this type of insect trouble has been put on a

sound scientific basis. By perfecting means of measuring the released gas and, in conjunction with stored products entomologists, determining concentrations necessary to kill the insects at all stages of their life cycle—egg, larva, pupa, and adult—fumigation can now be regarded as an effective weapon. It is, in fact, the only effective weapon against insects which have become well established in a big building in which quantities of foodstuffs are stored. It is true that much can be done to keep down the trouble by means of the pyrethrum-white oil spray, grease banding walls, and by general warehouse hygiene, but these methods are palliatives rather than cures.

There is, however, the equally important question of prevention to be considered. In certain parts of America there exists an arrangement between the universities and the flour mills whereby the latter are periodically inspected by entomologists who have specialised in this class of work. Incipient infestations which would be overlooked by anyone but an expert are thus discovered and eradicated instead of being allowed to develop until drastic measures are necessary. There is also a good chance of the source of the trouble being traced and further outbreaks prevented.

A similar scheme is under consideration by some of the milling firms in this country, and there seems no reason why such a service should not be extended to include all buildings and factories where food products are stored.

Routine entomological inspection has a greater value than the obvious method of preventing and checking local outbreaks of infestation. Complete control of insect pests of any type can only come through a thorough understanding of the insects themselves, their life histories and biology under all normal conditions of climate and environment, their movements, their potentialities for spreading, and their geographical origin. The movements of the stored products insects are worldwide; in this age of fast shipping and rapid overland transport, produce fresh from the remotest regions of three continents may be carried together in the holds of a single ship. In the great warehouses where dozens of different commodities are housed for months—and sometimes years—in the same building infinite opportunities occur for the transference of infestation and for the adaptation of the insects to fresh pabulum.

Top—Indian Meal Moth on Raisins.
Bottom—Cocoa Moth on Beans.

Some of the leading port authorities and shipping and manufacturing companies in this country are already alive to the value of such knowledge, and afford the entomologists who are studying stored products insects every facility for the furtherance of their investigations.

At the end of the chain is the food manufacturer. Insect infestation of raw products is serious enough, but insects in retailed goods may well prove disastrous. A single female moth escaping from the raw material store to the packing room of a factory could lay enough eggs in a single night to infest more than a hundred packets. The eggs are barely visible to the unaided eye, and they take nearly a week to hatch. The newly hatched caterpillars are themselves so small that they also usually escape detection, and the chances of such an infestation being noticed before the goods are well on their way to the consumer would be slight.

Against such a danger as this only preventive measures are of any value, and the obvious one is to ensure that such insects are not present anywhere in the building. Until this can be made possible by preferably regular, or, alternatively, occasional, inspection by an entomologist there is much information and advice available to those who desire it. The factory personnel should be encouraged to look out for and report any insects, or goods which appear to be insect-damaged; the insects should be identified and advice obtained as to their nature and economic importance and the best methods of control.

# Milk in Bread?

## F. E. Thomas, M.A., contributes to the Discussion opened in the February issue and continued in that of May.

**In view of the paper read by Mr. Rees-Jones at the recent Llandudno conference of the National Association of Master Bakers, in which he discussed the question of Milk in Bread, it is interesting to note that we had received the following article from Mr. Thomas before Mr. Rees-Jones' paper was presented.**

THE ANSWER to the question as to whether the inclusion of milk solids in bread is a thing to be ardently desired appears to be determined by whether the disputant is a seller of milk or a maker of bread. The public who eat the bread either with or without milk solids have very little say in the matter.

In the February FOOD MANUFACTURE an interesting article appeared on this subject by "Ignoramus," who took the stand that it was impracticable to find the milk solids and that, considering every point of view—nutritional, economical, and so on—it wasn't worth the doing. The price of bread would be increased without any compensation for the baker. He was duly taken to task, quite nicely, in the May issue by Mr. P. J. Shortt, who proceeded to deal with the misstatements of "Ignoramus." I now propose to point out, as nicely as Mr. Shortt if possible, where the latter gentleman has gone wrong in his turn.

Presumably, "Ignoramus" represents the baker's point of view, just as Mr. Shortt represents the milk vendor's; the writer claims to stand more or less halfway. He does not deny that the addition of milk, or milk solids, would increase the nutritional value of bread to a certain extent. As regards questions of supply—where the solids are to come from—I propose to let Mr. Shortt and "Ignoramus" fight it out. The brief comments to follow refer mainly to two aspects of the matter:

(1) Why it is proposed to add milk solids.
(2) The economic side of the question in the bakery.

Mr. Shortt states that "it is merely a fortuitous circumstance that the farmer may benefit through the widespread use of milk in bread. The baker himself and his customers are the principal beneficiaries. . . ." Now, Mr. Shortt hails from the United States, I believe, and I do not doubt that he is very fully acquainted with the trend of events there in the milk-in-bread campaign. It is, however, quite another matter in this country. The truth is that at the present moment the farmer is the spoiled child of the community and certain energetic people have been looking round for fresh markets for his produce. Unfortunately for the baker, bread is one of the few articles of food into which you can put anything; in the States they have even tried tomatoes and chocolate. In our own country they have tried raisins and currants, walnuts, cocoa, and a few other things, and of course milk bread is quite well known. The idea of using up milk solids—a waste or by-product from the dairies—in bread must, therefore, have seemed to these good people a heaven-sent solution. Now, the writer is neither a baker nor a farmer, and is quite prepared to accept the opinion that farming has been the Cinderella of businesses and one that deserves to receive a little kindness and consideration. But he will only accept this opinion if those supporting the farmer will agree that the baking trade is the twin sister of Cinderella and deserves just as much consideration; at the present moment bakers are not getting this. The milk-in-bread campaign in this country is designed to benefit the farmer first and foremost; its protagonists do not care in the slightest whether it helps the baker or not.

I would here make it clear that I entirely agree with Mr. Shortt as to the nutritive value of the milk proteins and mineral solids. Further, it is well known that there is a lot of under-nourishment among children, that milk as such is almost an ideal food for them, and that there is a big surplus of it. The right way, without any doubt whatever, to use up the surplus is to feed it to the children as *milk*, and any scheme by which this could be done should receive the support of every reasonable person. If milk, or fat-free milk, really *could* be incorporated into bread without any extra expense to the baker, again nobody would object; but every baker knows *practically that it cannot be done*, and my objection is to the endeavour to make the baker, already over-

burdened with legislation and other troubles, bear the extra cost of this addition.

For this will always be true—although it may not at once be obvious—that flour is the cheapest solid that can be used in a dough, and the substitution or addition of anything more expensive than flour will increase the cost of raw materials. This brings me to the gist of Mr. Shortt's argument and an examination of the figures he gives in support of his contention that not only would the baker not lose, but would be in pocket by adding 12 lb. of milk solids to the sack of flour.

I mention a few obvious points first.

(1) Fat is given as costing 8d. a lb. No baker uses fat at this figure. Lard costs 3d. a lb. and under, and some good baking oils are available below this price also.

(2) Sugar is included in the "water-bread" formula. Sugar is very rarely added to doughs in this country.

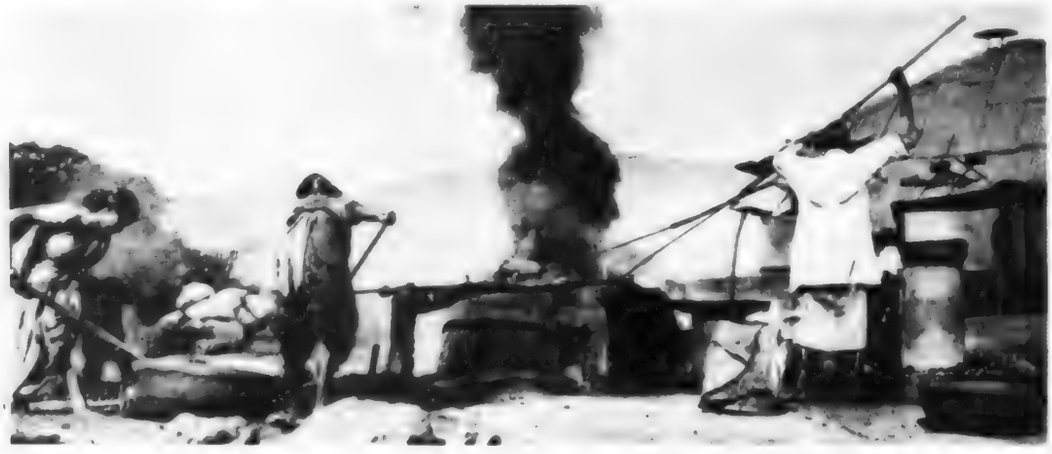
I now come to the matters in which practice refuses absolutely to support Mr. Shortt's theory.

(3) Mr. Shortt states that there is a lesser fermentation loss—1 to 1½ per cent. of the total dough batch—when an adequate proportion of milk powder is used. I challenge this statement. It is against any other opinion that I have ever heard expressed either by a baker or a baking expert. It is true that the addition of milk solids *slows* fermentation, but that means that the baker has to use *more* yeast (an expensive ingredient) or ferment for a longer time.

(4) He scales his water bread at 36½ oz. and his milk bread at 35½ oz. Why? This is totally unfair. There is no reason why one can be scaled 1 oz. lighter than the other. By doing this he saves 176 oz., or five and a half 2-lb. loaves, and this alters the economics of his argument altogether. He claims less baking loss with milk-solids bread, and presumably bases his right to scale at a lower weight on this statement, but this claim is not supported by such tests as I have done and read of myself, and I should like chapter and verse from Mr. Shortt. It is, on the contrary, the general experience here that bread containing even a lower percentage of milk solids than Mr. Shortt recommends goes dry more quickly than ordinary bread, and bakers who use milk solids add a generous amount of fat to make up for this defect. Mr. Shortt goes against practice by cutting down the 3 lb. of fat which he uses in his water bread to 2 lb. in his milk bread. (Milk bread, incidentally, is a terrible misnomer for the bread described. In Holland, about the only European country which has a definition of milk bread, it is compulsory to use nothing but *whole milk* as the doughing liquid if the resulting loaf is to be called "milk bread.")

If the figures of cost for the two breads are amended in the light of what has been said, I think that, without going into details, the matter assumes quite a different complexion, and it will be seen that far from making an increased profit, as suggested, by using milk solids in bread, the baker in many instances will be lucky to get any profit at all.

I have left a lot unsaid owing to limits of space, but would like to sum up the situation briefly. From the dietetic point of view, the inclusion of milk or milk solids is a most excellent addition to the nutritive value of the loaf. While existing legislation as regards the baker is in force, however, it is hopelessly uneconomic to think of his using as much as 12 lb. of milk powder per sack and selling the product as ordinary bread at the Food Council price. The only way in which the results arrived at can be achieved is either by making it compulsory to use so much milk powder in bread and arriving at a fair price for the new type of loaf, *or* by making it illegal to market a loaf as "milk bread" which does not contain a certain percentage of milk fat, proteins, or whatever standard is thought desirable. Definitions of milk bread with reference to the milk content have been arrived at in several countries, and the question of definition—and of chemical analysis to support the law—presents no serious difficulties. To obtain these legal enactments may be difficult, I grant, but it is the only fair way for the baker, and unless the idea receives strong support from the baker who—most naturally—will only support it if he sees some advantage, financial or of some other nature, there is little chance of it proving successful.



*(Courtesy of the High Commissioner for India.)*

**Roasting Cashew Nuts in Ceylon in order to obtain the Kernel.**

# VITAMIN STANDARDS and International Action

Mr. A. L. Bacharach, M.A., F.I.C., Chief Chemist at the Glaxo Laboratories, examines the principles upon which international standards should be based, and makes a number of useful suggestions.

IN JUNE, 1931, the Permanent Commission on Biological Standardisation, which is a constituent part of the Health Organisation of the League of Nations, met in London to consider the fixing of permanent or provisional international standards for various substances that could only be assayed by biological tests. Of these substances, the ones to be considered here are of interest alike to food technologists and pharmaceutical chemists, for the vitamins occupy a border-line position between essential food constituents and pharmacological entities.

At the time of the issue of the Permanent Commission's last report, which was published in October, 1931, it was generally understood that all the recommendations were of a provisional nature, and would be subject to review in two or three years' time. Three years have elapsed, and the Commission has just met again in London. The occasion seems, therefore, opportune for a general examination of the principles upon which international standards are based, and for a consideration of the extent to which the provisional vitamin standards have succeeded and might be made permanent.

It is necessary at the outset to be clear about the difference between an *international unit* and an *international standard preparation*. The first can be fixed, arbitrarily, at any time, and the second can then be altered to keep pace with advancing knowledge, without in any way interfering with the first, provided any new standard preparations are carefully assayed against the old ones in terms of the agreed international unit. I shall hope to make this point clearer later on.

It is perhaps also necessary here briefly to recapitulate the developments that led to the adoption of international units and standards. When vitamins were first recognised as properties of, or substances present in, natural foods, their detection was mainly a question of "all or nothing". Either a foodstuff contained vitamins or a vitamin, or it did not. It soon became clear that the position must be refined. A foodstuff showing the presence of vitamins when fed at a level of 5 gm. a day to an experimental animal might show nothing when fed at a level of 0·5 gm., and some kind of quantitative conception obviously needed introduction. As soon as this happened workers began to compare different substances in respect of their content of the same vitamin, and gradually this led to a large amount of confusion, for two reasons. To take a simple example, the vitamin A apparently present in green leaves might either be compared to the amount present in an "average" sample of cod liver oil or to the amount present in an "average" sample of butter; the results would obviously be quite different, and not comparable unless the relationship between the butter and cod liver oil samples was also known. The second reason for confusion was a much more serious one, and inherent in the nature of animal assay. This again can best be illustrated by taking a simple example.

Suppose an experimenter wished to find out how much vitamin C was present in a sample of orange juice. He would test this on a group of guinea pigs, and find what was, say, the minimum quantity necessary to initiate normal growth rate in a group of guinea pigs that had been fed for two or three weeks on a diet as free as possible from vitamin C. He might, if he so wished, call this average amount a "unit" of vitamin C. Some months later another experimenter might decide to carry out the same experiment on, shall we shall, grapefruit. Suppose he found that 2 ml. of grapefruit juice were necessary to do what had previously been found effected by 1 ml. of orange juice. The natural tendency would be for the second investigator to claim that grapefruit juice had half the vitamin C content of orange juice. But this would not follow from his results. Unless he could say for certain that his particular group of guinea pigs responded to vitamin C in just the same way as the group used by the first experimenter, he would have no basis whatever for comparing grapefruit juice with orange juice. And it is unfortunately only too well known by those who have to use animals as test material that the sensitivity even of large groups of animals in the same laboratory to the same dose of a therapeutic substance may vary markedly from season to season and from year to year.

This difficulty is, of course, in no way confined to tests for vitamins; it is common to all pharmacological standardisation that is based upon animal assay. To meet this pharmacologists had already agreed in principle to

the setting up of standard preparations, which should consist of the stablest available source of the active substance to be standardised, arbitrarily defined as containing a specific number of units of activity in a unit weight or volume. In this way the pharmacologist came to the aid of the pharmaceutist and provided him with units and standard preparations of digitalis, strophanthin, pituitary (posterior lobe) extract, and also of a number of antitoxins and sera.

In all these instances the use of the standard preparations depended upon the same principle. The standard is assumed to be permanent in the sense that it will not appreciably lose biological activity over a specified time, and it is intended that assays on material of unknown activity shall always be made by comparison with a contemporaneous assay on the standard preparation, or on a secondary standard preparation that has itself been assayed in terms of the standard preparation. In this way, provided sufficient animals are used, and provided the technique of the assay is in other respects satisfactory, uncertainties due to variations in animal response are largely eliminated.

The extension of this principle to vitamin assay was first made officially in 1931, and again an illustration may serve to show how it was intended that this extension should operate. Suppose a particular sample of yeast was to be standardised for vitamin $B_1$ content, and suppose that it was found necessary to feed on the average 1 gm. of this yeast per day to a young growing rat to restore its growth to normal when it was receiving a diet complete in all other respects but deficient in vitamin $B_1$. Suppose that a sample of wheat germ was tested on another group of rats in another laboratory, or at a different time, and it was found that $\frac{1}{2}$ gm. of that wheat germ was the smallest amount required to restore normal growth. The comparison of these results would at once suggest that the yeast was half as active as the wheat germ. Let us suppose, however, that both experimenters had taken the precaution of testing simultaneously the international standard preparation of vitamin $B_1$, of which there are 10 international units in every gram. The first investigator finds that his 1 gm. of yeast per animal per day gives an amount of growth that is given by 20 mgm. of the international standard, so that the yeast can be defined as containing 2 units per gram. Suppose that the second investigator finds that the growth given by his rats when receiving $\frac{1}{2}$ gm. of wheat germ was the same as that given by 10 mgm. of the international standard. In that case his wheat germ would be assayed as containing 2 units per gram—that is to say, exactly the same activity as the yeast, although his comparison in the absence of a standard preparation would have suggested that it had twice the activity.

It can now be realised what an immense simplification the extension of international units and international standard preparations to cover all known vitamins would make to nutritional experts, medical practitioners, food technologists, biochemists—to all those who, for one reason or another, are concerned with the vitamin contents of foodstuffs and other materials. Where these units have been brought into use on a sound basis much confusion has already been eliminated, but it is to be regretted that the workers in certain countries appear to lag behind seriously, in spite of the fact that the official representatives of those countries have been signatories to the 1931 report.

It may be noted that the United States, although not a member of the League of Nations, is represented on the Permanent Commission, and U.S. representatives attended the 1934 conference. It was very much to be hoped that the representatives of Russia and Germany could also be present, but it is definitely understood that the latter have withdrawn from the Health Organisation as well as from the League of Nations as a whole. It cannot be doubted that this must in the long run create serious difficulties for the German pharmaceutical manufacturers, to mention only one group of individuals. In many foreign countries they will be selling vitamin preparations in competition with the manufacturers from countries that have taken part in settling the international unit, and who are declaring the activity of their products in terms of that unit; in sheer self-defence the German manufacturers will have to do the same. They will thus find themselves in the curious position of being compelled to standardise in terms of units and to use international standard preparations in whose fixing their own representatives have taken no part.

At the 1931 conference provisional standards were laid down for four vitamins—namely, A, D, C, and $B_1$. We will take these in that order, for the position has altered considerably in the first three instances, and to an appreciable extent in the fourth.

## Vitamin A

In defiance of certain generally accepted pharmacological principles, the Permanent Commission adopted for vitamin A an international standard preparation of carotene, which was then believed to be a precursor of vitamin A in the animal body, though it was considered not to be identical with it. The chemical relationship between vitamin A and carotene has now been fairly completely worked out, and it is generally agreed that $\beta$-carotene has about half the activity of vitamin A, while $\alpha$-carotene is less active. The international standard preparation actually contained about 80 per cent. of $\beta$-carotene, and was made by accumulating samples of carotene from various laboratories, combining them, and recrystallising the mixture, a task that was carried out by the National Institute for Medical Research in Hampstead, London. The international unit for vitamin A was defined as the activity of 1 microgram of the carotene specimen that was adopted as the international standard preparation. Unfortunately, its use has been fraught with considerable difficulty. It would be unjustifiably forestalling publications that are at present in the press to say more here than that the use of carotene introduced into animal assays further complications and unknowns that do not appear to be present when vitamin A properly so called is under examination. The effect of this is that two investigators, both comparing the same cod liver oil, for example, against the same sample of carotene, whether the international standard preparation or not, may evaluate this oil differently in terms of the carotene.

Several explanations for this curious and unfortunate phenomenon are conceivable; a likely one is that experimental animals—in this case rats—differ in their ability to absorb and convert carotene into vitamin A, as well as in their ability to make use of vitamin A itself. The second source of variation could be eliminated if tests for vitamin A were always made against an international standard preparation of vitamin A itself, but the complications introduced by making carotene, which is not vitamin A, the test substance can obviously not be eliminated by any direct procedure.

Very rich concentrates of vitamin A have been prepared, and it is generally accepted that those of Carr and Jewell (*Nature*, 1933, **131**, 92) and of von Euler, Karrer, and others (cf. *Helv. Chim. Acta*, 1934, **17**, 24) represent concentrates containing at least 95 per cent. of the vitamin. These concentrates, either as such or dissolved in an appropriate oil with a small amount of antioxidant, such as hydroquinone, would almost certainly be at least as stable as carotene, and their stability could be checked by following up any deterioration with colour tests and spectrophotometric observation. There are several organisations making vitamin A concentrates on large scales, and they would doubtless be able and willing to contribute material for blending into an international standard preparation. Alternatively, a representative sample of cod liver oil might be obtained by blending suitable specimens, but the objection to this would be its relative bulk. High quality cod liver oils contain from 0·025 to 0·1 per cent. of vitamin A; a concentrate of the kind suggested above would be only one-thousandth as bulky, or even less. The third possibility would be to replace the present impure standard preparation with a sample of pure $\beta$-carotene.

## Vitamin D

The vitamin D position has undergone an even more revolutionary change. Since the issue of the 1931 report calciferol has been not only made in the laboratory, but prepared on an increasingly large scale as an article of commerce. Opinions appear to differ whether pure calciferol contains 40 million or 50 million international units per gram, the international unit being defined as the amount of antirachitic activity present in 1 mgm. of the international standard preparation; this is a solution of irradiated ergosterol in olive oil, made and held at the National Institute for Medical Research in Hampstead. Experimental evidence as to the stability of this product is fairly definite, and suggests that no serious change takes place if it is held in cold store, with exclusion of atmospheric oxygen, for twelve months or even longer. Now that the pure crystalline vitamin has been isolated, however, there is little reason to use anything else as the international standard preparation. The Permanent Commission will have to settle at what number of units they propose to fix the activity of calciferol, for there can be little doubt that it will enter into the international standard preparation on some basis or other.

## Vitamin C

With vitamin C, also, there has been an equally revolutionary, but much less expected, change. Ascorbic acid is now generally held to be, if not the, at any rate an, antiscorbutic vitamin. The international standard preparation fixed in 1931 was the fresh juice of the lemon, and its selection was made in the belief that lemon juice was an approximately constant source of antiscorbutic activity. There is a considerable amount of evidence to show that this assumption was invalid, but it is difficult to avoid the appearance of arguing in circles when discussing the point. If the antiscorbutic activity of lemon juice is compared with that of ascorbic acid, the ratio of the two is found to vary, in extreme cases, as much as 100 per cent. If we assume that ascorbic acid is the pure vitamin, it is obvious that lemon juice must vary in activity; but if we insist that lemon juice is constant, then we are driven to the conclusion that ascorbic acid, whatever else it may be, cannot be a constant and homogeneous substance. The chemical evidence as to its identity is, however, so conclusive and the general reasons for doubting the constancy of lemon juice as an antiscorbutic material so plausible, that most investigators now consider it essential to replace the present international standard preparation by ascorbic acid. It is obviously again a matter of pure convention whether its activity be fixed on the basis of the lowest or the highest or some intermediate sample of lemon juice. According to this decision, ascorbic acid will have to be defined as containing somewhere between 10,000 and 20,000 international units of vitamin C per gram, since lemon juice has been found to have an ascorbic acid content varying from 1·0 to 0·5 mgm. per millilitre, and the present international unit is defined as the amount of vitamin C present in 0·1 ml. of lemon juice.

## Vitamin $B_1$

The international standard for vitamin $B_1$ has been, in a sense, the happiest of the lot, since the response of animals on a $B_1$ deficient diet to treatment is much more regular, and much less subject to uncontrollable variables, than that of animals to other vitamin supplements. Two different experimental animals are used—the rat and the pigeon—and on the whole give results showing reasonably good agreement. At the same time, from the point of view of the pure chemist the use of the present international standard preparation, which is a fuller's earth adsorbate of vitamin $B_1$ made from rice polishings in the Government Laboratories at Batavia, leaves a good deal to be desired. During the last year various investigators have prepared crystalline specimens of vitamin $B_1$, but they are certainly not identical. Whether this means that there are several different $B_1$ vitamins, according to the source, or that these various crystalline preparations are still by no means pure, but share in common varying amounts of the actual vitamin, still remains to be established. It is, however, fairly certain that preparations of vitamin $B_1$ much more concentrated than the existing international standard preparation could be made and distributed. But the remarkable stability of the present preparation, and the fact that the rat and the pigeon both seem able to de-adsorb the vitamin from the fuller's earth base, make any immediate alteration unnecessary, even though it might be contemplated on somewhat aca-

demic grounds. It seems probable that little change will be made in the international standard preparation, of which 10 mgm. are defined as having an activity of 1 unit.

### Vitamin E

Whether the Permanent Commission will be able to adopt temporary units and standards for other vitamins is very doubtful. The increasing interest in the use of the anti-sterility vitamin E, both in the clinical and the veterinary fields, makes it desirable that some kind of unit should be available in the fairly near future, but the lesson of the vitamin C standard would seem to be that merely to define the standard as a sample of wheat germ oil would be to court serious difficulties. There should be no such difficulty if a concentrate of wheat germ oil unsaponifiable matter were prepared on a fairly large scale and held under conditions similar to those suggested for vitamin A. It is doubtful whether much of this standard would be required before the next meeting of the Permanent Commission, but it might stimulate a much-needed advance in vitamin E research if some temporary standard were available and some unit defined in the meantime.

### Vitamin $B_2$

Recent work on vitamin $B_2$ has suggested, though not finally proved, its identity with certain naturally occurring water-soluble fluorescent dyestuffs, known under the general name of lyochromes, and called specifically ovo-flavine, lacto-flavine, uro-flavine, and so on, according to the particular origin. It is difficult to suggest anything practical in the way of a standard for this vitamin. Yeast, treated to remove vitamin $B_1$ and other alkali- and heat-labile constituents, is used in the laboratory as a source of vitamin $B_2$ in diets intended to be deficient in one or other constituent of the B group, but to contain adequate $B_2$. It would, however, be difficult to define the international unit in terms of an autoclaved yeast preparation, since yeast itself is almost certain to vary somewhat in vitamin $B_2$ content, and the method of treatment will in turn have an appreciable effect on the amount left in the autoclaved material; to make sufficient autoclaved yeast for a vitamin $B_2$ standard would also not be at all an easy matter. It seems probable that the $B_2$ question will have to stand over until further advances have been made by the several groups of workers at present investigating the chemical and physiological properties of the lyochrome group.

*(Courtesy of the High Commissioner for Canada.)*

**Picking Strawberries in Canada.**

# Conductometric Analysis

THERE HAS been a great advance in recent years in electrometric methods of analysis, and in particular the measurement of *p*H has come in for a good deal of attention. Conductometric methods have been less popular, perhaps because the determination of the conductivity of solutions presents certain difficulties. However, a knowledge of the conductivity of solutions often leads to valuable information not readily obtainable otherwise, and comparatively recently there have been considerable advances in investigations along these lines.

In the monograph under review will be found a very systematic survey of the subject. The author first discusses the notion and significance of electrical conductivity and the preparation of conductivity water. Then follow descriptions of conductometric titration apparatus and special methods of working, and after this separate chapters are devoted to particular problems, as the conductometric titration of strong acids and strong bases, weak acids and weak bases, estimations involving precipitation, etc.

Included among its applications in industry, discussed briefly (but with full references to the original literature) in the final chapter, several will be of interest to readers of FOOD MANUFACTURE.

An elaborate system of wine analysis has been worked out by Dutoit and Duboux. To quote from the book:

"The potassium sulphate and moderately strong organic acids are estimated by a single conductometric titration with baryta. Volatile constituents—*e.g.*, acids, including sulphurous and carbonic acids, weak alkalis, including ammonia, and very weak organic bases—are estimated after distillation by suitable conductometric titrations. Conductometric methods have been described for estimating chloride, phosphate, calcium, potassium, and magnesium, but the accuracy obtainable is not always satisfactory."

It has also been shown that "The conductometric titration of beer with alkali not only gives the acid content, but the graph gives valuable information relating to the nature of the acids present."

Vinegar presents another problem—namely, the estimation of traces of strong mineral acids in a weak organic acid. It has been found that "as little as 0·1 per cent. of hydrochloric acid in acetic acid can be accurately estimated conductometrically with 0·1 *N*-sodium hydroxide, provided a *N*-solution of the acetic acid be used."

The analysis of jam provides another instance of the usefulness of conductometric methods.

Sugar products, molasses, honey, etc., have been evaluated from the ash content and conductivity measurements. In the case of honey, the water, ash, and dextrin contents have been found to be related to the conductivity.

Important results are stated to have been obtained in the case of milk, where it is claimed that conductometric titration with alkali gives accurate values for the amounts of acid and albumen. It was not possible "to determine accurately the amount of water added to milk, but . . . the amount of dilution of any particular milk (could be determined) from the variation in conductivity." It was found that milk with a conductivity above the average was always given by cows with diseased udders, and "conductivity determinations can be used to detect cows suffering from *streptococcic mastitis*."

It has been found that the conductivity of aqueous extracts of wheat flour is largely dependent upon certain organic, mainly nitrogenous, compounds, and can be used to give an indication of the origin of the wheat. It is claimed that admixture of inferior wheat can be detected.

The maturation of bread dough may be tested by conductivity measurements, and an apparatus has been patented for this purpose. (*Conductometric Analysis. By H. T. S. Britton, D.Sc., B.Sc., D.I.C., F.I.C.* 178 *pages, with numerous graphs and circuit diagrams. Chapman and Hall, Ltd., London*, 1934. *Price* 12*s.* 6*d.*)

N. R. F.

## AIR CONDITIONING

DURING a conference on air conditioning at Leeds, Dr. Lampitt described how air conditioning had been utilised in his experience in food manufacture. He pointed out that it was not always necessary to have 100 per cent. conditioned air, but that for certain products semi-complete conditions were sufficient. These last two speakers both referred to the expense involved in commercial air conditioning and the need for simplification of plant as far as possible. The discussion proceeded keenly and without hesitation. It emphasised the wide appeal of the subject, and showed that many industries, other than the textile trade, appreciated the probable value of air control. Photographic plates and films, sugar, flour, and bread were among those entered in the discussion, and the question of the subsequent storage by the retailer was referred to by several speakers.

# RETARDING RANCIDITY

CONSIDERABLE interest is being shown in an American patent, dealing with means for delaying rancidity in fatty substances (U.S.A. Pat. No. 1,898,363, Feb. 21, 1933). taken out by George R. Greenbank, dedicated to the free use of the Government and the people of the United States.

The invention relates to inhibiting the oxidation and retarding the development of rancidity in fats, oils, fatty acids, and substances at least one constituent of which is an organic material, a liquid, or solid, such as an unsaturated fat, oil, or fatty acid, which has a tendency to undergo a chemical change when placed in storage.

The terms "oxidation" and "development of rancidity" are considered synonymous; likewise "inhibitors of oxidation" and "retarders of the development of rancidity."

The addition of various substances to fats, etc., has been proposed before, but the nature of such additions was objectionable in foodstuffs.

In this patent, for the purpose of retarding rancidity, it is recommended to add to the fat or substance containing fatty material certain polybasic unsaturated aliphatic acids or their derivatives. It is claimed that the addition of even as small a quantity as one part in 10,000 parts of the fat, etc., will markedly decrease the rate of development of rancidity.

The chemicals specifically mentioned for the purpose include maleic acid, its anhydride, ethyl ester and sodium salt, also aconitic acid, fumaric acid, citraconic acid and itaconic acid. From tests which have been carried out, maleic acid itself appears to be the most effective retardant.

Some interesting results are given of tests on certain materials, with and without the addition of one part in 10,000 of maleic acid.

In each case the materials were stored under conditions favouring the development of rancidity—*e.g.*, at 42° C. At definite intervals samples were removed and examined for peroxides (which accompany rancidity) or the development of rancid taste or odour.

The following table indicates the number of days the materials mentioned kept free from rancidity—with and without the addition of maleic acid:

| | *Control.* | *Treated.* |
|---|---|---|
| Peanut oil .. .. | 13 days | 37 days |
| Butter .. .. .. | 15 ,, | 47 ,, |
| Whole milk powder .. | 21 ,, | 65 ,, |
| Pie crust (equal parts of lard and flour) .. | 6 ,, | 15 ,, |

It will be noted from the above figures that in each case the addition of one part of maleic acid to 10,000 parts of the material increases the keeping time threefold. The temperature at which the tests were carried out is equivalent to some 107° F., which covers the usual summer temperatures, during which season most trouble is experienced from rancidity.

Presumably the action is one of preferential absorption of oxygen by the maleic acid, though we cannot yet satisfactorily explain its mechanism giving a result out of all proportion to the amount present. The action of calcium hydroxy phosphate as a drier for salt, etc., is another case which has to be regarded at present as inexplicable.

Whether any objection under the food laws of this country can be raised against the use of maleic acid has yet to be determined.

## FOOD LITERATURE

THE fifth volume of that extremely useful publication of the Food Investigation Board, the *Index to the Literature of Food Investigation*, has just been published. As in former years, it has been compiled by Miss A. E. Glennie, B.Sc. Although the same general method of presenting the information has been maintained, this year's issue is marked by several improvements which make for clarity and greatly facilitate the reader in turning up the references to the particular subject in which he happens to be interested. The main points are a more detailed general index of subject matter, the announcement of the main divisions at the head of each page, the spacing of the matter so as to render the subtitles more prominent, and the inclusion of a list of authors. We also notice another new feature which serves a very useful purpose, and that is a preface reviewing the chief developments during 1931-32.

We consider this is one of the most generally useful of all publications relating to research and technology in the food industries. The work costs only 5s. net and is published by H.M. Stationery Office.

H. B. C.

## NOVEL PRODUCTS

TWO novel products noted by an American contemporary are a spread containing spray-dried milk, butter fat, milk sugar, peanuts, and citrate of iron, ground to a paste and packed in an atmosphere of nitrogen, and a prune pulp and lemon juice product for the preparation of which dried prunes are used. These are stated to be cooked in closed kettles and then automatically pitted. The pulp, with the lemon juice added, is then passed through sieves in an atmosphere of steam, and the product is vacuum packed.

# German Corned Beef

Of recent years German food canners have devoted much attention to the establishment of a native corned beef industry which would stand up to the severe competition of the American product. It will be interesting, therefore, to compare their procedure with current American practice. Two methods used in Germany are cited by our contemporary.*

1. The beef of good, medium-fat cattle cut up into pieces about the size of one's fist is first pickled for a week in a solution composed of 2,600 gm. salt, 100 gm. saltpetre, and 200 gm. sugar dissolved in 10 litres of water. Without troubling to rinse the impregnated meat, the latter is immediately and thoroughly pre-cooked, and then canned while still fairly warm. Experience has taught that least trouble is thus experienced in canning.

No necessity arises for incorporating broth, "schwarten," and other binding agents, since the meat pickled in the manner described possesses an innate binding power and actually keeps better in the absence of artificial binders. The can should be filled right to the top with the meat prior to sealing and retorting. The latter is carried out at 112° C. for 1½ hours, allowing an additional 12 minutes for heating up and cooling down. After sterilisation the cans are cooled to 25° C. and passed on to the store.

2. The meat from best selected cuts of the carcase is detached from the bone in sections which are individually hung to mature. Marrow is removed from the comminuted bones and all portions washed clean. The bones themselves are brought to the boil and there maintained for 7 to 8 hours. Stress is laid upon the importance of gradually bringing the water to the boil.

After removing the bones from the pot the meat broth is defatted, strained through gauze, and thereupon combined with the cut meat in a kettle in which the mixture is boiled slowly for 2½ hours with continual removal of the scum. When no more blood can be removed from a piece of the cut meat, the cooking period may be regarded as ended.

Of great importance is the addition of the meat to the hot meat broth and not to the cold liquor. The meat is cut up into slices of appropriate size and at once canned. The broth is again filtered and defatted, when it serves as canning liquor. Owing to the meat being packed very tightly into the cans it may be advisable to introduce a portion of the broth at the outset. The contents should be packed in such a manner that, after inverting the open can, the contents should form a cohesive mass rather like meat preserved in jelly.

It is usual to employ square cans of 3 to 5 litres capacity, which are retorted at 120° C. for 120 minutes in the case of the 3-litre size and for 150 minutes in the case of the larger size. In each case extra periods of 12 minutes are allowed for the rise and fall of the temperature. The cans are slightly cooled after sterilisation.

It is not recommended to sterilise German canned corned beef on the water-bath, since the compact nature of the packing renders it difficult for sterilisation to be completely effected at 100° C., and this temperature is hardly likely to be reached at the centre.

* *Translated from the "Braunschweigische Konserven-Zeitung", 1934, No. 10.*

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## CIDER MANUFACTURE

The accompanying illustration shows a fermenting room with "pipes" containing 120 gallons of apple juice in full fermentation. Immediately after the extrusion of the "white head" has ceased the bung hole is closed with a tight bung fitted with a glass fermentation lock, half filled with water. This device is designed to prevent access of air, and the yeast and bacteria accompanying it, to the cider; low alcoholic beverages are particularly liable to acetification (vinegar formation), caused by the access to the cider of *Bacillus xylinum* which is widely distributed in the atmosphere. The locks also afford a very convenient means of observing the rate of fermentation.

*Industrial News*

# PLAY THE GAME!—WATER SOFTENING—NEW WRAPPING MACHINE—NEW PACKS AT EXHIBITION—A NOVEL WINDOW DISPLAY—IRISH CONFECTIONERY INDUSTRY—CALL FOR RESEARCH—ELECTRIC MOTORS

## Play the Game!

Messrs. Dewey and Almy, Ltd., manufacturers of the well-known adhesives, tell us that they have heard of another make of paste being sold under their characteristic number; moreover, it has come to their knowledge that one of their customers has purchased this material under the impression that it was their own product.

They say: "It has never occurred to us to register these numbers, which were primarily intended for our internal information, and refer only to the number of the final and successful experimental batch, but they have gradually become part and parcel of the trade description under which we sell our products, as—Dewalco Prepared Lap Paste No. 950.

"In this particular case, the number indicates that 950 experimental batches were made up, all of which were tabulated and tested out before Dewalco Prepared Lap Paste, in its present successful form, was placed on the market."

It is obvious, of course, that in the one case the number is an important characteristic, conveying significant information to the customer, while in the other case it represents nothing but an attempt to make a sale on the strength of the reputation of Messrs. Dewey and Almy's product.

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## W. J. Bush and Co.'s List.

A recent list includes all kinds of essential oils, fixed oils, flavourings, and fruit essences, floral ottos, food colours, soluble essences, liquid colours for aerated waters, concentrated natural fruit juices, preservatives, chemicals, etc.

## Water Softening

A practical handbook on water softening has recently been issued by Imperial Chemical Industries, Ltd. This booklet, which is called *The Control of Water Softening and Boiler Feed Water Conditioning*, is a practical sequel to two publications previously issued by I.C.I., in which the applications of the lime-soda process to the respective problems of industrial water softening and boiler feed-water conditioning were fully discussed in their theoretical aspects. It has been designed to show how users of the process for these purposes may be enabled to maintain a close control of the composition of the water used. Such a control is of the greatest importance, since the efficiency of many industrial operations is easily impaired by variations in the composition of the water supplied. A quite surprising amount of relevant information is contained within its modest compass of thirty-nine pages; all the tests described are essentially simple, rapid and reliable, and have been made even more so by the provision of convenient formulæ for calculation purposes.

The second part of the booklet deals with the practical aspects of boiler feed-water conditioning, and analyses for blow-down control. No untreated natural water is entirely satisfactory as boiler feed, and the rapid development of high-pressure boilers, and the widely varying nature of available water supplies have combined to emphasise the necessity for adequate treatment and the control of that treatment.

The handbook should be mainly suitable for those users who are already testing their supplies, and for those who have either chemical knowledge or laboratory facilities, or both. It should also obviously be of value to analysts and consultants. It is emphasised that, although the analytical methods described in the booklet are sufficiently accurate to allow the calculation of the quantities of softening reagents required, and to maintain a reasonable control of the process, it is considered advisable to check the results by an occasional complete gravimetric analysis of the water.

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## New Wrapping Machine

Packers of concentrated soap cubes will probably be interested in a new wrapping machine which packs twelve tablets in one row and wraps with an inner wrapper of cellulose and an outer band label.

The machine, which is manufactured by Rappings, Ltd., is entirely automatic. Tablets are thrown into a hopper, from which they are fed into the wrapping machine twelve at a time and wrapped with the cellulose and outer band label. The output of the machine is said to vary from about 70 to 75 packets a minute. The wrapper, which needs the attention of only one operator, has been tested by several well-known packers, all of whom report favourably, we learn, on its performance.

▼ ▼ ▼

## Changes

Messrs. G.K.S. Combustion Co., Ltd., have moved to High Holborn House, 52, High Holborn, W.C. 1. Tel. No. Chancery 8513.

Messrs. The Cellophane Co., Ltd., formerly of 6, Bird Street, W. 1, are now at 179, Tottenham Court Road, W. 1. Tel. No. Museum 2162 (4 lines). Telegraphic address—Cellophane-Eusroad London (as two words).

The telegraphic address of Messrs. John Bellamy, Ltd., Byng Street, E. 14, is now—Bellamy Phone London.

## New Packs at Exhibition

Several striking designs were shown by the Metal Box Co., Ltd., at the Modern Packing Exhibition recently held in Regent Street, London. A tin for cheese crisps was shaped like a thermos flask and very strikingly finished in bright red and green on silver. An excellent display box for chocolates had a sloping front divided into three portions, giving a very effective means for directing the attention to a special brand. Tins for tea in new and attractive octagonal shapes and having Oriental decorations were also displayed by this company.

Several firms showed novel pack-and-display units, those on the stand of Messrs. Johns, Son and Watts, Ltd., presenting a very happy combination of utility and æsthetic appeal.

On another stand were shown a number of cartons for dried fruit in very attractive designs, and a novel triangular-shaped box for wafers caught the attention.

Turning to packaging on a larger scale, all kinds of cardboard and fibre boxes and packing-cases for dozen and gross lots of Swiss rolls, chocolates, condensed milk, puffed rice, etc., were shown by Thames Board Mills, Ltd., as well as folding cartons, rigid boxes, show-cards, etc., in all shapes and sizes.

Packing-cases for pickles and other materials in glass jars were exhibited by another firm; these were designed on a new principle effecting a very considerable saving in volume and weight, and avoiding the use of sawdust or other messy filling material. The jars were separated from one another by rubber-covered bars, and the arrangement was a considerable advance on the older methods in respect of safety and economy.

Very efficient metal seals for packing-cases and paper parcels were shown by the same firm.

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## Japanese Sugar Developments

Thirteen centrifugal extractors, arranged as a self-balancing unit, have been built for the Japanese sugar industry; all parts in contact with the products are of Monel metal.

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## Chocolate Moulds in Monel

A New Zealand manufacturer of chocolate moulds uses Monel metal for the purpose, as he obtains a more brilliant surface on the chocolate than he could get by using tin-coated moulds. Moreover, he finds that Monel metal moulds last longer and are more easily cleaned.

This is a photograph of M. Fernand David, the President of the Third International Technical and Chemical Congress of the Agricultural Industries, held at Paris. M. David himself is responsible in no small measure for the success of this famous Congress, which has been converted into a permanent institution. He has a distinguished record in French agriculture, having been "in the public eye" for more than thirty-five years.

M. David was a Deputy in 1898, and was taken into the Poincaré Cabinet as Minister of Commerce in 1912; he became a member of the Senate in 1919. He was Minister of Agriculture in various Governments on nine different occasions, so that it is easy to realise that his knowledge of his country's resources and needs must be considerable.

In 1925 he had the responsibility of organising the International Decorative and Industrial Art Exhibition, which is well remembered as a very great success.

He has been asked by the French Government to preside at the International Decorative Art Exhibition which is to be held in Paris in 1937. At various times he has been President of societies and associations of chemists connected with sugar production, distilleries, the agricultural and horticultural industries, etc.

He is a member of the National Academy of Agriculture of France and President of the National Tourist Office. Evidence of the esteem in which he is held in this country may be found in his possession of the Grand Cross of the Order of the British Empire.

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## A Novel Window Display

A window demonstration carried out by a chef in front of a microphone and his running commentary relayed to the passers-by . . . this was the form of an interesting window display staged through the co-operation of a well-known firm of food manufacturers (Alfred Bird and Sons), Philips Industrial, of Charing Cross Road, and 30 grocers and other foodstuff retailers in the London and the Portsmouth districts.

The chefs, in white caps and jackets, were provided with a number of recipes for custards and waffles, and as they added the various ingredients, mixed the batter, and greased the waffling irons, they explained each process to the crowd which quickly gathered on the pavements outside the shops. They had been provided with "copy" by the manufacturers, but the commentary was delivered in an informal and spontaneous manner.

A tie-up between the windows and the counters was arranged by girls selling the advertised product inside the shop. Most of the retailers expressed themselves as very satisfied with the results of the display, and the clarity of tone of the relaying apparatus, the latter obtained on hire from Philips Industrial.

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## Irish Confectionery Industry

During the past few months, according to *Food Industries Weekly*, the Trade Board for the Sugar Confectionery and Food Preserving Trades in the Irish Free State has been exceedingly active.

The Board has decided that only 20 per cent. of the employees in the industry can be juveniles—*i.e.*, persons under 18 years of age. This decision was reached at a meeting at which the employers were in the minority, and efforts are now being made to have it rescinded.

The manufacturers' representatives have already endeavoured unsuccessfully to have the proportion of adults to juveniles reduced from two to one.

It is argued in the industry that through the marriage of female workers and other causes, it would be almost impossible to preserve the proposed proportion.

A proposal by the workers' representatives that wages should be increased by 1½d. per hour on the present rates was defeated. It is the opinion of employers that under present circumstances the industry cannot afford to increase costs in this or any other way.

### Call for Research

A call for broader distribution of purely scientific data collected in commercial laboratories, and a protest against the secrecy imposed by certain firms in that direction was made by Dr. L. H. Lampitt, chief chemist of Messrs. Lyons, when delivering the Jubilee Memorial Lecture of the Society of Chemical Industry on "Some Fundamental Scientific Problems of the Food Industry," in Edinburgh recently.

"It is only rarely," he said, "that a firm has chemical knowledge which is of importance to that firm; it is seldom that to disclose the results of a chemical investigation would be to play into the hands of competitors. I feel that a large amount of work is stored in food laboratories which, without any disadvantage to the owning concern, could be given to the scientific world."

On the subject of fruit juice, Dr. Lampitt pointed out that no methods had as yet been found whereby freshness could be retained over a period of storage. Hit and miss methods were the order of the day, but they had failed completely to find a solution of the problem. "I maintain that if it were known in chemical terms on what freshness depends," he said, "then the problem could be attacked from a much more fundamental standpoint. We know nothing of the more subtle constituents of fruit juice, and I would suggest that until we do, this problem will not be solved except by some lucky chance."

One of the most outstanding examples where fundamental work was necessary was in the case of flour. "Not one of the processes from the milling of the flour to the eating of the loaf is understood," said Dr. Lampitt. "Demonstrations of 'springiness' in loaves are all very well—but why does one loaf do this and another that, some returning to shape like a jack-in-the-box, others acting like a jack-in-the-box with a weak or broken spring? Why does one loaf stale more quickly than another? No one knows scientifically, because no one understands staling."

Meat had been grossly neglected by the chemist, and it was impossible to say with any degree of certainty what changes took place when meat was in the course of preparation for consumption. The more visible and easily detected changes had been studied from the time the animal was slaughtered until it was ready for cooking, but the changes were little understood, particularly from the chemical point of view, and changes in the numerous bodies occurring in small amounts had received practically no attention.

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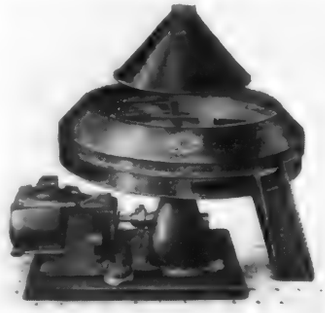
### Electric Motors

We have received from The Normand Electrical Co., Ltd., of 3, North Side, Clapham Common, S.W.



4, an illustrated brochure showing the application of their "NECO" motors to various machine assemblies, among which may be mentioned a rotary sweet cooler, Pfaudler glass-lined pasteuriser, mincing machine, dough divider, labelling machine, wrapping machine for sweets, cake-whisk, etc.

A rotary sweet cooler driven by one of these motors is shown in our illustration. The machine is made by Brierley, Collier and Hartley, Ltd., of Rochdale, and very effectively replaces the 30-ft. conveyor employed in the older methods. The sweets are fed to the centre of a table which rotates slowly under a cold air blast, and they move spirally round the table to the outlet, travelling 38 ft. in all, though the machine is only 8 ft. 6 ins. in diameter.

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### Thermostatic Switch

The "EVST" temperature operated electric switch, produced by the Drayton Regulator and Instrument Co., Ltd., West Drayton, is made in three patterns for temperatures up to 500° F., 1,000° F., and 1,800° F. It is suitable for the automatic control of water heaters, ovens, ducts, and other plant where the regulating device has to be installed through a wall; it can be fitted in any position.

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### Liquid Seasonings

These are now being increasingly used for flavouring meat and fish pastes and sausages, as they ensure uniform distribution of taste and are standardised in quality and strength. Among those offered by Messrs. A. Boake, Roberts and Co., Ltd., of Carpenters Road, Stratford, E. 15, are ginger, sweet herbs, thyme, coriander, pepper, marjoram, mixed spice, cayenne, and sage.

## RECENT PATENTS (Continued from page 268.)

407,485. **Slicing bread.** WEBSTER, N., 33, Buckland Crescent, Hampstead, London.

A device for holding foodstuffs during slicing comprises a plate having a handle on one side and prongs projecting from the other side, the food—*e.g.*, a loaf—being impaled on the prongs in such manner that its upper side is below the top edge of the plate. The plate is then always interposed between the knife and the hand grasping the handle. Three prongs may be provided, the outer prongs being shorter or longer than the middle prong to facilitate the impaling. The handle may be secured to a tang cut out of the plate and bent over. The device may be made in wire, in which case the plate would be of triangular form, the prongs being arranged along the base.

407,526. **Alcohol Recovery from Baking Ovens.** Convention date, France, March 3, 1932.

It is proposed to pass the vapour mixture from bread-baking ovens through a thermostatically controlled apparatus comprising essentially two clusters of very narrow tubes grouped on each side of a central compartment and connected by an adjacent condenser-separator. By suitably adjusting the temperature in different parts of the apparatus sufficient alcohol for the baking process can be condensed and returned to the ovens, whilst the remainder is later collected in the concentrated form in a special vat.

407,959. **Dextrose fondant.** STUCKEY, U. J. G., and STEINER, J. A.

A process for a fondant with very high dextrose content is based upon the addition of a so-called grain-retarder to moderately hot dextrose solution, thereby rendering the stock workable for a long period. The grain retarder, in the shape of maltose, honey, corn syrup, etc., is added to the boiled mix whilst the latter still flows readily from a spoon. Example: 20 lb. dry dextrose powder in 5 pints water are brought to the boil and then skimmed before transferring to a suitable mixer, which is started up after the mass has cooled, preferably to 90° F. When the liquid becomes opaque but still flows from the spoon, 24 lb. invert corn sugar mixture are incorporated. At the same time colouring and flavouring agents may be conveniently added.

# INFORMATION and ADVICE

**Fish Pastes—Calves'-Foot Jelly—Food Manufacture—Emulsions—Chicory in the U.K.—Fats—Compound Lard — Cheap Chutney — Fruit Sauce — Spoilage of Cans — Books Wanted — Chocolate Tablets—Ribbons for Confectionery—Sugar Confectionery — Chocolate Varnish — Confectioner's Cream—Agencies**

## Fish Pastes

1,604. *Kindly supply information on the manufacture of salmon and also crab pastes, etc.* (London.)

With regard to your enquiry on the subject of formulæ for fish pastes, the composition of these varies so very widely that there is really not much point in quoting any particular recipe.

So much depends on the grade of paste being manufactured and the type of market intended for it. I have several times previously given directions for the manufacture of these, and also given one or two recipes by way of example.

There was an article in *Food Industries Weekly*—the March 23 issue—which dealt with meat and fish pastes, and I would suggest that you read this, as it gives some general instructions in the matter, and there was a general article on fish pastes published in FOOD MANUFACTURE for June, 1932.

By way of example, you may, for the preparation of a salmon paste, use—

| | |
|---|---|
| Salmon .. .. .. .. | 60 lb. |
| Bacon fat .. .. .. .. | 9 ,, |
| Salt .. .. .. .. .. | 1½ ,, |

and incorporate into this basis sugar, white pepper, ground mace, and coriander seed in amounts required to give an attractive flavour.

Bone the fish and mix well with the other ingredients. Pass through a mincing machine and fine sieve and sterilise, at 240° F., 3-oz. jars for about 40 minutes.

Of course, this is only one of many possible variations of a salmon paste, and you could use other types of flavouring ingredients according to your own particular requirements. You could also substitute part of the salmon by shrimp and make a salmon and shrimp paste.

With regard to crab paste, you would, of course, in a good quality product, use crab meat for your base, bolstering it up with perhaps about 25 per cent. boiled hake. Flavouring ingredients need to be carefully chosen and each manufacturer has his own particular recipe for these. Some manufacturers employ a cheese and dried mustard as ingredients. In most cases, sugar would probably not be used, although salt would form an ingredient in about the same proportion as a salmon paste.

## Calves'-Foot Jelly

1,605. *We have a large quantity of calves' feet in our cold storage, from which we would like to manufacture calves'-foot jelly.*

*We would thank you to inform us the best method for making this product, the best temperature for cooking the feet, and how to get the jelly turned out clear and bright.* (Ireland.)

Information as to the plant required and the general method of procedure was supplied.

1,606. *Can you recommend a source of supply for tomato flour as used in the manufacture of cheap tomato sauces and pastes? Also advise us the best preservative to use in pastes made with tomato purée.* (Sussex.)

In reply to your enquiry, preservatives are not added to sauces and pastes, and the method adopted to ensure safe keeping lies in using hygienic and sterilised containers and plant, and, in the case of sauces, the correct vinegar content. The presence of spices also helps. In the case of tomato sauce, the product, after it has been bottled and capped, should be sterilised.

Suggestions were made as to sources of supply.

## Food Manufacture

1,607. *I have turned my hand to manufacturing foodstuffs, and would be glad to have recipes for preparation of glacé cherries, mincemeats, meat pastes, marmalades, etc.* (Canada.)

You will realise that you are asking questions which would take a whole book to answer properly. It is not much use giving bare recipes, as so much depends on manipulation, output intended, amount of capital available for plant, type of market, and many other factors.

I think that you are beginning at the wrong end. You ought to study your market and definitely decide upon one product for which you think there is an opening and then concentrate on that. Having met with success you could take up other products as opportunity offers.

Glacé cherries, for instance, are very difficult products to make successfully, and you would certainly have to make an extended series of trials before you would acquire the necessary skill to turn out a successful

article. We have published fairly complete articles on this subject.

The same remarks apply to mincemeat. There are many possible formulæ for mincemeat, depending on the class of trade, whether for bakers or for the general public; and, again, much depends on the type of raw materials available for this purpose. Again, we have published articles and formulæ.

We had an article on meat pastes in the July, 1932, issue of FOOD MANUFACTURE. Here, again, a lot depends on the raw materials which are at hand. You can make meat pastes out of almost any form of meat, with the addition of a cereal filler and spices. There is no special difficulty in making this product. The critical part of the process comes in the sterilisation of the containers after they have been filled and capped. However, this information you will obtain from the article.

With regard to marmalade, here, again, there is a wide variety of products, such as jelly and ordinary marmalade, and their particular character will vary according to local taste. We have given a general account of the procedure in the *Food Industries Manual*, to which we would refer you.

In brief, the operation for the preparation of ordinary marmalade is to peel the oranges and treat the peel and dummies separately. The dummies are steamed until the pips are loose. Then pass through a sieve, preferably in the form of a pulping machine, whereby the pips are separated out. The peel is cut up and boiled until tender. The peel and pulp are then mixed together and brought to a uniform strength by the addition of water. A formula for the marmalade would be something like the following:

| | |
|---|---|
| Orange pulp (equivalent to 28 lb. oranges) | 4 gal. |
| Sugar | 58 lb. |
| Water | 2 gal. |

Dissolve the sugar in the water by aid of heat and skim bright. Add the pulp to the syrup and boil to 222½° F. Of course, pectin can be used in the preparation of marmalade.

In the case of lemon and grapefruit marmalades, it is up to you to make trials, using various proportions of these fruits in order to obtain the particular kind of flavour which you think most suitable.

If, therefore, you proceed as suggested above and decide definitely upon one single product, I will be only too willing to give you whatever information can be communicated in the form of a letter.

1,608. *We are anxious to get in touch with manufacturers of pastes or similar products who are requiring distribution of their goods. Can you give us some names and addresses?* (Birmingham.)

We should be glad if interested readers would communicate with us, when we will send their names to our correspondents.

## Emulsions

1,609. *We are sending you a sample of our wine and egg yolk preparation, which, as you will see, is an emulsion. Could you give any opinion as to whether it is likely to separate?* (Lancs.)

I have received your sample of wine with egg yolks, and up to now it has shown no sign of separation. It might take several weeks before any separation occurs in the undisturbed liquid.

I am afraid that we have no facilities here for carrying out laboratory tests upon which to base an opinion as to how long it will keep up without the emulsion breaking. Certain tests, such as boiling, centrifuging, etc., are usually carried out in order to test the stability of an emulsion, thus dispensing with the necessity of waiting for several weeks or months to see how the emulsion holds up. A good test is to tie a bottle of the emulsion to a car and see how long it is before the emulsion breaks.

You will understand that in order to be able to express a reliable opinion from such tests, it is necessary to have had a considerable amount of experience in carrying them out on various types of emulsions in order to accumulate comparative data—*i.e.*, to be in a position to correlate results of laboratory tests with behaviour of the emulsions under average conditions of storage and transport. I am willing to recommend consulting food chemists who possess this knowledge.

One wonders if there is any danger of your material fermenting or undergoing chemical changes which would lead to a physical breakdown.

## Chicory in the U.K.

1,610. *I should be much obliged to you if you could give me some information, of a general character, on the U.K. consumption of chicory.*

*I should like to know whether the bulk of that produce is retailed for private consumption or, on the contrary, is used by blenders of coffee, for instance.*

*Perhaps you could let me know whether, on the whole, the coffee which is drunk in this country is made from blends or mixtures of coffee and chicory, ready-made in packets, or if this blending is made on the spot*—i.e., *in the coffee-houses, the restaurants, and at home.* (London.)

Information was sent covering the points raised.

1,611. *We wish to get in touch with a firm who will loan us a canning machine if we buy cans from them.* (Manchester.)

Suggestions were made.

## Fats

1,612. *Could you tell us the difference between the following commodities:*

(1) *Lard Compound.*
(2) *Shortening.*
(3) *Vegetable Fats.*

*We are wondering whether there is any simple publication describing the slight difference in these particular commodities.* (London.)

With regard to lard compounds, I cannot do better than to give you the definition given in the Canadian Regulations under the Food and Drugs Act, 1928:

"Compound Lard, Lard Compound, etc., is a mixture of animal and vegetable fats and oils. It must be free from rancidity, be made from sound and pure materials, and contain not more than 1 per cent. of substances other than fatty acids and fat, and at least 51 per cent. of actual lard shall be present in the article.

See also reply to enquiry under the heading of "Compound Lard" below.

Shortening was discussed in an article by Mr. H. W. Avis in our January, 1933, issue, and if you will refer to that you will get a pretty good idea of the meaning of the term.

The term really refers to fats which are used in the baking trade to impart certain qualities which are embodied in the term shortening—that is to say, the cake is rendered more tender and fresh. Shortening helps to keep wet particles of cake dough from running together and producing a more or less solid or homogeneous mass.

The majority of shortenings consist of cotton seed oil, coconut oil, or palm kernel oil, merely refined or partially hydrogenated and refined.

Vegetable fats really include any fats of vegetable origin. The fats mentioned in connection with shortening would be classified as vegetable fats.

## Compound Lard

1,613. *As I am interested in the manufacture of compound lard, I shall be obliged if you will refer me to books dealing with this matter and give me the names of makers of plant suitable for this material.* (Scotland.)

With regard to your enquiry on the subject of literature dealing with compound lard, I am afraid that there is no book published dealing especially with this subject.

I am, however, quoting you the following paragraph taken from *By-Products in the Packing Industry*, and trust that this will be of some assistance to you:

"About 84 per cent. of deodorised cotton seed oil, mixed with about 16 per cent. of oleo stearin, forms compound lard. After mixing, the product is run over a lard roll in a manner similar to prime steam lard, in order to give it increased heat resistance and to whiten it. In making a lard substitute, the purpose is to reproduce closely the physical charateristics of pure lard. Therefore, some ingredient is added which will give a melting point to cotton seed oil that will approximate that of pure lard. Formerly about 38 per cent. of tallow was added to the oil, and the standard method for a long time was the addition of 13 to 18 per cent. of oleo stearin. These ingredients were weighed in a scale tank, running the oil in first and then the stearin. They were mixed together and filled into packages by passing over a chilled cylinder in a manner similar to that of chilling and filling pure lard. The only difference between the methods of chilling and filling compound lard and pure lard is that the compound lard is usually held at a higher temperature when feeding it upon the lard cylinder, and the roll is kept colder."

Even under the best conditions, however, lard substitutes are not as white as pure lard, but sharper chilling and more beating in the picker-box produces a whiter compound lard. Within the past ten or fifteen years the process known as 'hydrogenation' has come into existence. About 10 per cent. of fully hydrogenated cotton seed oil is mixed with 90 per cent. of straight deodorised cotton seed oil to produce a lard substitute. It is also run over lard rolls like compound lard. Frequently the oil is only partially hydrogenated, to approach as nearly as possible the consistency of pure lard, and this partially hydrogenated oil is run over the lard roll to produce another form of lard substitute. Furthermore, deodorised cotton seed oil becomes a solid if placed in the household refrigerator. In order to produce a cotton seed oil that will remain liquid at low temperatures, the oil is slowly cooled, and the stearin, or hard fatty acids, are extracted by means of a filter press. The resulting oil is "salad oil."

Recommendations were made as regards firms supplying plant.

## Cheap Chutney

1,614. *Will you kindly give me a recipe for a chutney which must be very cheap?* (Canada.)

For a very cheap chutney use is made, as a base, of apple baggings, although the practice is not one to be recommended from a quality and ethical point of view. For instance, one might employ as the main ingredients 112 lb. apple baggings, 10 lb. finely chopped onions, and 25 lb. brown sugar, and 7 gal. of 5½ per cent. acetic acid. Here again the questionable practice of using acetic acid in place of vinegar crops up. The choice of flavouring and colouring is largely a matter for the individual. One might, for example, use mustard, curry powder, turmeric, and caramel.

## Fruit Sauce

1,615. *Please supply a recipe for fruit sauce.* (Canada.)

As previously pointed out, there are very many possible variations in formulæ for fruit sauces. You should, first of all, study the article which we published in the March, 1933, issue on the manufacture of sauces and then use the formula quoted as a basis for your own experiments. You cannot hope to make a sauce successfully without considerable practice in manipulation, and the chief points to observe are stressed in the article mentioned above. Perhaps the most important point is the choice and blending of the spice, and this is where experience counts. You could prepare a fruit sauce from dates (say, about 56 lb.) as a basis, together with finely chopped onions (say, about 2 lb.). As thickeners wheat flour and gum tragacanth may be employed to give the required viscosity, and as flavouring materials you could use salt (about 10 lb.), ginger, cayenne, and coriander seed. Such a mixture would require about 50 gal. of 16-grain vinegar. Soak the gum and ground spices. Simmer all ingredients about 15 minutes and pass through a 10-mesh sieve.

1,616. *We enclose herewith small packet of granular soup powder.*

*Our clients, Cor. 2,311, who already make a soup*

*powder in the form of a fine powder, wish to make a granular soup powder similar to the enclosed sample, and they would be much obliged if we could give them a recipe or any information on the subject.*

*They wish to handle about 6 cwt. per day.*

*We understand that the mixture will consist of culinary herbs, salt, sugar, cornflour, peaflour, etc., and we should be extremely obliged for any information you give us in relation to this matter.* (Gloucester.)

Suggestions were made; matching would require the services of a food chemist—we could find somebody who would undertake the job.

## Spoilage of Cans

1,617. *As regular readers of your journal, we should like to have your opinion as to the cause of the defect in some of our products, sample tins of which we have sent forward to you to-day.*

*We might mention that the ingredients used in the manufacture of this line were all mixed and handled at the same time. They were also processed at the same time, and for some unknown reason we have a very large percentage of cans similar to the unlabelled one sent you, and we should very much like to know if you can give us any indication as to the reason.*

*We ourselves have examined these cans, and in the case of the unlabelled can the contents have taken on a distinctly sour taste and smell, while those of the labelled can are perfectly sound and up to our standard. We might also mention that we have been manufacturing this line for some considerable period and occasionally instances of this nature do crop up, and we have never been able to really get to the bottom of them.* (Scotland.)

The only satisfactory way is to have the matter properly investigated by a bacteriologist.

## Books Wanted

1,618. *We have some friends in Sweden who are going into the manufacture of jams and jellies, etc., and wish to obtain one or two books on the subject of jam production and manufacture. Can you please recommend us any suitable books on the subject?*

*We wrote to the Department of Overseas Trade and they suggested we should write you.* (London.)

As far as we know there is no book dealing with the manufacture of jams. One was published several years ago, but this is now out of print. We would suggest that you refer to the confectionery section of *The Food Industries Manual*, wherein a good deal of information is given on the subject.

1,619. *I have noticed your interesting publication here in this city, and am taking the liberty of asking if you could help me in a matter that is of much importance to me.*

*I want to get some book or other publication dealing with the subject of preparing glacé crystallised fruits.*

*If you know any such book or paper will you be kind enough to ask the publishers to let me know of same and the price, which will be gladly forwarded by British money order.*

*Your own publication is of much interest here, and will you please let me know the subscription for a period of one year, postage paid, to this city.* (Singapore.)

We had an article on the subject of preservation, etc., of glacé cherries in our November and December, 1933, and January, 1934, issues of FOOD MANUFACTURE, but as far we know there is no one book dealing with the subject, but one or two chapters are devoted to it in *Commercial Fruit and Vegetable Products*, by Professor Cruess, price 22s. 6d.

We shall be very glad to obtain a copy of this if you require it.

1,620. *Can you give us the names of any firms who deal in citrus fruits and citrus juices who might care to get in touch with exporters of these from New Zealand?*

*Can you inform me of any book or article giving details of the composition of juice from first quality citrus fruits such as oranges, lemons, grapefruit, etc., especially with reference to dietetic value?*

*Any information you have on the subject will be much appreciated.* (Kent.)

Suitable firms were suggested.

As regards literature dealing with the composition of citrus juice, the following will be of interest:

*Principles of Fruit Preservation*, by T. N. Morris.

*Food and the Principles of Dietetics*, by Hutchinson and Mottram.

"Analysis and Composition of California Lemon and Orange Oils," by H. D. Poore, *Tech. Bulletin No.* 241, March, 1932, U.S. Dept. of Agriculture.

"The Chemical Composition of the Orange," by J. S. Braverman, *Hadar*, March, 1933.

"Some Less Appreciated Constituents of Orange Juice," by Dr. S. G. Willimott, *The Pharmaceutical Journal and Pharmacist*, June 25, 1927.

"The Vitamins of Commercially Concentrated Orange Juice," by S. G. Willimott, *Biochemical Journal*, vol. xxii., No. 2, 1928.

"Vitamin C Content of Orange-Crush Beverage," by E. M. Koch and F. C. Koch, *Industrial and Engineering Chemistry*, vol. 24, No. 3, p. 351.

1,621. *We should be very much obliged if you would kindly inform us what issue of the* FOOD MANUFACTURE *deals with the manufacture of mincemeat.*

*We should also like to know of any issue dealing with the manufacture of chocolate compound.* (Liverpool.)

In the October, 1932, issue of FOOD MANUFACTURE we had an article on mincemeat manufacture, and we shall be very glad to send you a copy on receipt of your order.

We regret that we have not had any information on chocolate compounds, but we are making enquiries about the matter and hope to publish some information in an early issue.

## Chocolate Tablets

1,622. *Required: The procedure for the manufacture of plain chocolate tablets. We want to produce flat tablets about* $2 \times 1 \times \frac{1}{8}$ *in. or so thick, each to contain a*

*certain amount of medicament. We should like to know how plain chocolate is made and what machinery would be necessary; also either cost of machinery or address of makers. A brief outline only is asked for so that we may judge whether we could tackle the job before going deeper into the matter. The quantity required to be made is not expected to be more than 5 to 10 cwt. a day.* (Yorkshire.)

I do not think it would pay you to set up machinery for the purpose you mention. The better way is to get a manufacturer (names were sent) to carry out the whole operation of mixing the ingredients and casting the chocolate into the required tablets.

### Ribbons for Confectionery

1,623. *I have just been approached by a French manufacturer of ribbons for the confectionery and chocolate trades who is anxious to be put into touch with a reliable agent in this country.*

*I have, therefore, thought that you might be able to let me have a few names of your readers who would be, in your opinion, interested by taking up such an agency. In that case, I would be glad to ask my correspondent to submit to them particulars of his manufactures with prices and conditions of agency.* (London.)

We should be glad if any of our readers, being desirous of taking up such an agency, would communicate with us, when we will put them in touch with our enquirer.

### Sugar Confectionery

1,624. *I am making and selling coconut ice, peppermint creams, and fudge. I find some difficulty in keeping the sweets sufficiently fresh over a long period. The coconut ice and peppermint creams keep from two to three months and the fudge about three weeks. Can you help me in any way to solve this difficulty?* (England.)

Without knowing the actual recipes and methods of manufacture, it is difficult to advise on this matter. Creams are usually crystallised, which reduces the tendency to dry out. Faults in manufacture can cause graining. Glycerin to the extent of about 4 oz. to the cwt. has a beneficial effect in each of these lines. Albumen frappé is of some help, as is also a proportion of invert sugar; in fudge, a little lecithin delays graining and reduces the drying out.

### Chocolate Varnish

1,625. *You state in a recipe: "Gum benzoin 30 per cent. and alcohol 70 per cent." Please let us know the strength of the alcohol. For what class of chocolate work is this varnish used? What is the meaning of "chocolate medallion," as we cannot find any translation here?* (Japan.)

Strong alcohol is used—viz., 90 per cent.—and so 30 parts of gum benzoin must be dissolved in 70 parts of this alcohol. This can be used for all glazing purposes, but of course there is a possibility of taste and smell from the gum. Chocolate medallion, etc., is included in solid chocolates which are moulded.

### Confectioner's Cream

1,626. *I wish to prepare a confectioner's cream of the type which is now largely substituting fresh cream*—i.e., *a cheap edible oil emulsified with, say, skim milk and added casein, etc. Certain of the commercial brands are characterised by abnormal whipping capacity, and I should be glad if you could indicate how this is obtained. I am also interested in the preparation of a ready-whipped material for supplying to confectioners ready for use, and would appreciate any information re this.* (England.)

At this stage in the development of these products I feel that it would not be fair to manufacturers and to consulting food chemists to publish detailed information. In any case, it merely boils down to an emulsification problem, and your best plan is to secure the services of a chemist who has a laboratory emulsifying machine, or who has access to one, and to provide him with instructions as to the properties you require in the product (or a sample to match), together with some general ideas as to the main raw materials from which he can make his choice. A good chemist should be able to equal or even improve on the products already on the market. It is by no means a questions of recipe alone.

### Agencies

1,627. *Required:* (1) *Agencies, on a commission basis, for any kind of food products suitable for the Belgian market. Prices to be c.i.f. Antwerp or Brussels, packing and all charges included.*

(2) *Offers solicited in French francs c.i.f. Beyrouth for any lines likely to be of interest for the Beyrouth market, where I have a client who would appreciate suitable offers.*

(3) *Ditto, Egypt.* (Antwerp.)

Interested parties are requested to communicate with us; immediately we receive any replies we will put them in touch with our correspondent.

1,628. *We are experiencing difficulty in registering the temperature of marshmallow in the boiling stage.*

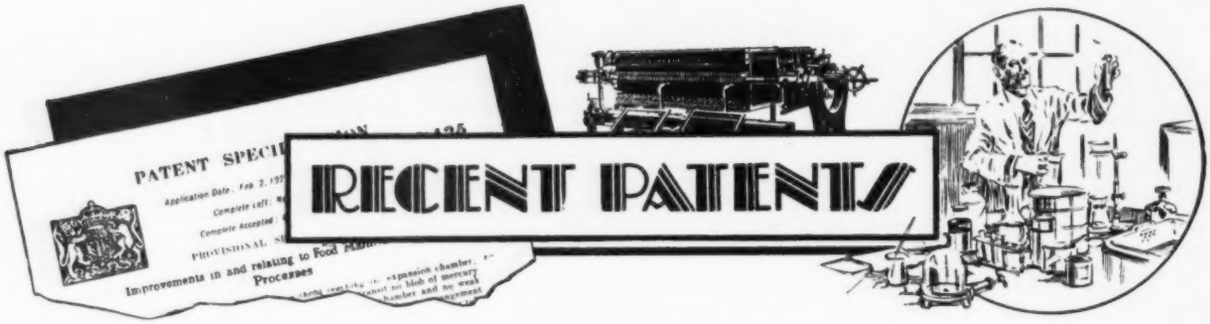
*This is due to the fact that while the water is being boiled off, the temperature remains stationary at round about 210°. It is during this period that the contents are sufficiently boiled and ready for beating. At present it is a matter of guess work, and we have tried the use of a hydrometer without success.*

*We should be very much indebted to you if you could make any suggestions.* (Birmingham.)

The only thing that I can think of is that your thermometer must be wrong. Actually you should boil your glucose and sugar up to 236° F.

I think that it is pretty safe to say that your thermometer is not working correctly and that you will have to get another one.

(*Enquiries 1,629 to 1,640 are unavoidably held over to the next issue.*)

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### Latest Patent Applications

13587. Barr, M.: Treatment of coffee. May 4.
13618. Illingworth, W. H.: Process for cooking meat. May 5.
13651. Duttweiler, G., and Ianz, P.: Preserving foodstuffs, etc. May 5.
13741. Murray Deodorisers, Ltd.: Pasteurising, etc., lacteal liquids. March 24, 1933. (New Zealand, September 22, 1932.) (Cognate with 11933/33.)
14009. Reavell, J. A.: Production of whey food products. May 9.
14059. Clement, J., Mace, A., and Rabate, S. G.: Manufacture of hydratopectin. May 9. (France, May 13, 1933.)
14076. Field, F. D.: Cardboard, etc., containers for fruit, etc. May 10.
14088. Vicars, Ltd., T. and T., and Crosland, E. M.: Treatment of dough. May 10.
14301. Baldus, R.: Packing fruit juices, etc. May 11.
14442. Griffiths Laboratories, Inc.: Curing-salt. May 12. (United States, May 18, 1933.)
14640. Ramesohl and Schmidt Akt.-Ges.: Manufacture of pressed yeast. May 15. (Germany, June 26, 1933.)
14738. Bassett and Co., Ltd., and Bywaters, H. W.: Manufacture of sweetmeats. May 16.
14895. Aluminium Plant and Vessel Co., Ltd., and Turbet, W. G.: Pasteurisation, etc., of milk, etc. May 17.
14932. Dierbach, R.: Disintegrating cacao. May 17.
14991. Hancock, L.: Machines for producing ice cream, etc. May 18.
15020. Dowden, H. C.: Treatment of molasses, etc. May 18.
15094. Henkel et Cie, Ges.: Manufacture of crustless cheese. May 18.
15197. Vickers, H.: Compositions of cooked meat, etc. May 22.
15252. Hobart Manufacturing Co.: Slicing machines. May 22.
15258. Cloud, W. S.: Coating confectionery. May 22. (United States, May 25, 1933.)
15335. Eyde, S.: Manufacture of soup, etc., preparations. May 22.
15394. Royal Baking Powder Co.: Acid calcium lactates. May 23. (United States, May 23, 1933.)
15791. Kellie and Son, Ltd., and Kellie, R. W.: Machines for grading fruit, etc. May 28.

### Complete Specifications Accepted

405,864. Fernholz, E.: Installations for producing carbonated beverages.
405,906. Wilcken, W. H.: Production of an aqueous emulsion of a fat-dissolving medium.
405,953. Renwick, F. F.: Means for the sealing of containers.
405,990. Flakice Corporation: Freezing of liquids, particularly applicable to ice making.
406,184. New Process Fat Refining Corporation: Method of distilling fatty acids and the products resulting therefrom.
406,398. International Yeast Co., Ltd., and Hutchinson, H. B.: Preservation of yeast.
406,407. Siemens and Halske Akt.-Ges.: Method of removing inorganic sodium and/or chlorine compounds from milk.
409,687. Hanseatische Mühlenwerke Akt.-Ges.: Production of edible soups and sauces.
409,727. Sardik, Inc.: Food products and their manufacture.
409,750. Gilbert, W. V. (Orno-Ornfeldt, E., and Loew, O. M.): Treatment of raw coffee.
409,790. Lunt, W. R. F.: Method of treating food for human consumption.
409,885. Aluminium Plant and Vessel Co., Ltd., and Seligman, R.: Apparatus for use in the storage of milk, cream, and other similar perishable liquids.
409,977. Fickenscher, W.: Machines for working liquid, pulverised, or granular materials, particularly for mixing and conching cacao and chocolate materials.
410,170. Joseph, C.: Wrapping material for all purposes.
410,401. Glasgow, L. E.: Juice extractors.
410,834. Mantle Lamp Co. of America: Process for inhibiting the formation of undesirable colour in animal or vegetable oils or fats and the oils or fats produced thereby.

*Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.*

### Abstracts of Recent Specifications

*Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.*

406,184. **Distillation of fatty acids from fats and oils.** New Process Fat-Refining Corporation. Convention date, United States, December 1, 1932.

A process for distilling fatty acids under reduced pressure is outlined and is also claimed to afford a means of eliminating small proportions of free fatty acids from fats or oils. A continuous stream of the oil, which is first rapidly heated in an apparatus to 400° F. to 600° F., enters an enlarged zone under reduced pressure, where it meets a counter-current of superheated steam. The mixture of steam and fatty acid vapour is withdrawn through a vent, the temperature in the region of which is maintained at 375° F. to 550° F. The acid-free residue is continuously withdrawn so as to cut down the volume of material in the distilling zone.

407,461. **Cheese preparations.** Hanseatische Mühlenwerke Akt.-Ges., 3, Alsterdamm, Hamburg, Germany.

In the production of cheese less than 2 per cent. of a natural phosphatide—*e.g.*, lecithin—is added to the freshly prepared curd, or at a subsequent stage in the manufacture of the cheese. In the case of a processed cheese the phosphatide may be added before, during, or after the processing operation. The phosphatide may be employed in admixture with oil, stearin, or the like.

(*Continued on page 262.*)